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REVOLUTIONARY SCHOOLBOYS IN RUSSIA.

BY VICTOR E. MARSDEN, M.A.

THE Revolution in Russia is in full swing, and the only portion of the hundred odd millions of the population of the Empire of All the Russias which seems determined to still ignore the extent and significance of the movement is the unfortunate Emperor and his immediate entourage. The Ministers know the "deluge" is coming, but the Czar cannot be persuaded, or is not permitted by his august uncles and cousins, and yet more distant members of the Clan Romanov, to sign those instruments which would give effect to the innumerable promises of reform announced by him over the Imperial sign-manual in half-a-dozen loud-sounding manifestoes. Meanwhile the entire country is clamouring for fifty times more rights, privileges, and powers than would have made everybody happy if conceded only a few months ago. Indeed, the demands now made could not be satisfied in the freest of enlightened republics, and are utterly impracticable in semi-barbarous Russia, with an autocracy still, in spite of paper protests, in full force. Among the most active reformers are the university students, whose power and influence in a very poorly educated country are much greater than is generally supposed abroad. Their example is naturally followed by the secondary schools, whose best pupils will in a year or two also don the student's uniform. It thus comes about that "revolution" is nowhere so active as in the secondary schools, where the whole movement may be traced in miniature. At first sight it appears ridiculous that schoolboys of fifteen should pose as revolutionaries, but Russia is a very peculiar country, and what would raise only mirth elsewhere commands respect here. When you find a class of thirty boys, of ages ranging between fourteen and sixteen, mustering a dozen formidable-looking revolvers and a score of murderous knives among them, which are only too frequently inspected during dull moments of an uninteresting lesson, you are at first disposed to imagine all sorts of horrible accidents, but the wise teacher does not attempt to try confiscations as a remedy. The boys are probably recognised members of an organised "fighting band," and they do not take liberties with these dangerous toys. It is a point of honour with the ardent defender of the liberties of the people to carry his revolver in one pocket and its cartridges in the other when "off duty." Sheath-knives, a foot long, or those convenient Finnish knives which the Russian Government long ago forbade strictly, are less alarming and more easily concealed about the person. Even quite little boys defy their fond mothers and double the anxieties felt by every parent in these terrible times by carrying some kind of "weapon" wherewith to defend the honour of their uniform against the dastardly attacks of the "Black Gang." From defending themselves these ardent young citizens speedily went a step farther, and the older and stronger boys of a secondary school, to say nothing of the full-grown fellows of the "special" classes, are now enrolled as assistants of the Students' Fighting Bands. That is the meaning of the arsenal you find in every class of almost every school in Russia nowadays. The streets of Moscow are patrolled day and night quite unobtrusively by armed students and schoolboys, generally in civil clothes to avoid the notice which the uniform attracts. The city is portioned out into districts, each with its captain and staff. Any smart patrolman who sees signs of a "Black Gang" gathering for the fray rushes to the nearest telephone, or sends off a swift cab to headquarters, and out come well-armed "fighting bands," before whom the curs of the "Black Gang" disappear without a blow. Thus Moscow is protected by volunteers from the wretches whom the police hire for sixpence and vodka to "smash the *intelligentia*," as the authors of all the evils which are gathering fast about the heads of an irresponsible bureaucracy and its corrupt servants. And here let any reader who is disposed to wonder overmuch at schoolboys playing a

useful rôle in the State at so early an age, reflect how very rapidly even grown men, with fixed ideas and case-hardened habits, develop in times of revolution: the development of sensitive youth under similar circumstances is dangerously rapid for themselves, and a source of serious anxiety to other than the aching hearts of mothers.

The Schoolboys' Organisation, of course, is not solely confined to doing patrol duty with revolvers and knives. That is merely the "political" part of the programme. The "economic" part is concerned with the immediate needs of the youth of Russia. They demand freedom to form self-educator societies, to read whatever they think fit for them to read, to hold debates on any questions that appeal to them, to publish a school magazine —every one of which demands is gall and wormwood in the mouth of the "Ministry of Public Enlightenment," as the Russian Ministry of Education is called, on the good old principle of *lucus a non lucendo* presumably. The boys—and in saying "boys" I would be understood to include also the girls, who are not a whit behindhand in their demands, and the girl student takes her place also as a crack revolver shot in the "fighting bands"—further, insist on being taught such subjects, for example, as history in a genuine way. The present history approved by the "Ministry of Public Obfuscation" (as the irreverent term it) says that Nicholas the First stopped the Decembrist Conspiracy by appearing to the rebels with his little son in his arms and making a pathetic speech; which is much more poetical than the real story about the grape-shot at short range and the corpses thrust under the ice. And Russian history as taught in the Russian schools is full of "poetic" touches. But the boys and girls of Russia nowadays demand truth: "we do not come to school to be taught to lie," say they. Another demand, which seems outrageous anywhere but in Russia, is that the boys, through their parents, shall have some voice in the appointment of their masters. This is the boys' way of getting at a reform which they feel absolutely essential. Schoolmasters in Russia are compelled by the system to regard their boys much as Russian officers regard their soldiers. They must be smart at the word of command, and repeat by rote certain formulæ correctly whether they quite understand or not. Masters are forbidden by the system to discuss any questions arising out of a lesson, and lessons must be confined solely to the text-book, which has passed the censorship of the "Obfuscation" Ministry. The boys say, with perfect justice, that this is not education, but drilling by text-book. They want it changed, and see no other way to ensure this except by procuring the appointment of masters whom their experience has taught them to confide in as liberal-minded men who disregard the regulations of the system and treat their pupils as human beings. There is nothing absurd in this demand —in Russia; the absurdity is that it should ever have to be made, and the boys are not to blame for that!

Just at present nearly every school in the larger towns of Russia is either closed or is about to close, or has recently opened again after closing, all on account of the "revolution" among the schoolboys. They order obnoxious masters out of the class-rooms, and put them out by the combined force of thirty or forty pairs of arms if they object. They bar out their headmasters and insist on their resigning. The authorities of the schools, at their wits' ends, summon meetings of parents to see if anything can be done; and the parents are a trifle worse than the boys to deal with. Especially if the parents happen to be "old boys," and begin to recall their own experiences at school, with awkward questions about whether this, that, and the other abuse and injustice of their day is still going strong! Worthy mothers, who are obviously pinching to give their hopeful little rascals the benefits of "book larnin'," further increase the embarrassment of the authorities by saying: "We gave our children over to you to be taught; why is it you can't teach them without appealing to us?" The better-class parent, of course, understands that school-teaching and home-training are not exactly the same thing. And of course it is nobody's fault that so many schoolboys get no training at all at home. Many of the parents are the children of men who were slaves under the whip in their best days; where are they to acquire the rudiments of that knowledge which is worth all the education the most liberal government of the freest of countries ever provided for its subjects? That which the British boy, however humble, is taught at his mother's knee cannot be taught in any school; too many Russian mothers think it both can and ought. That backbone and fibre which a good father puts into his children, whether with the stick or without it, cannot be acquired so well at the age when boys go to school. The Russian sire says: "Here are my boys; make men of them!" and washes his hands of all further responsibility. The "Obfuscation" Ministry says: "Above all things, make 'politically sound' citizens out of your schoolboys"—which means they must be taught to worship the existing régime, and everything which might throw light upon its real nature must be diligently denied. Between one and another form of pressure the line of least resistance is that of hypocrisy and sham; outward submission, a little superficial polish, and the rest left to take its chance in life when school is done with and it is too late to mend. "Revolutionary" schoolboys are seeking truth and light, as healthy youth has ever done since the world began.

THE BLUE EXERCISE-BOOK.[1]

VERY early in my life, even before I really entered into life, I got my dread of official authority. Understand me; I don't say that gendarmes frightened me, but that I was afraid of being anything like a gendarme myself. A man armed with power which does not reside in himself is in danger of losing his interior equilibrium. The disproportion between what he is and what his authority permits him to do, becoming excessive, troubles and unbalances him; and the weaker he really is, the more he strives to hide his feebleness in demonstrating his authority by force. I understood all that whilst I was a schoolboy, and I promised myself that if ever my destiny made me a master of others, I would scrutinise my own acts even more than theirs.

We do not sufficiently fear the sense of justice of the young, we do not remember often enough that a class of children is a tribunal. They reason more soundly than we suppose; their clear eyes see us and judge us, they register in their memories our acts and our utterances of authority, with a fixity of impression that lasts them all through life.

[1] Adapted from *Les Benoît*, by Edmond Haraucourt (Paris: Librairie Universelle, 2½ frs.), by J. H. Y.

I was twelve years old, and I was a boarder and scholarship-holder; some thirty other lads assembled with me in the class, under the charge of an usher. He sat enthroned in his chair, to watch us work. He did not work himself; he whittled a flat ruler, and the long hours of his *ennui* showed in the dulness of his eyes. He was short, square, and dark, with a horse-shoe beard. I feared him, and he did not love me. Why he disliked me I never knew, but he did so, visibly and plainly, proving it on every occasion. He called me by my nickname, "Scarf," as the other lads had dubbed me. When he said "Scarf" all the class would laugh, partly for fun and partly to flatter him. The name did not offend me; my character then was gentle and submissive; I accepted things as they came. But I was top of my class, and so much in advance of the others that when my exercises were finished I had plenty of leisure to fill up. I mention this to explain how it was that I came, at so young an age, to write a romance.

Yes, a romance! And I have never worked at anything else with such ardour. Writing my romance was my self-set Sunday pleasure, my weekly festival. I see it now, in memory, my thick blue exercise-book; I opened it each Sunday with the joy of one who opens the door of his home at the week-end and sits himself down by the fireside. My romance was my hearth, my home, my secret; and I found it excellent and delightful.

It made me weep sometimes, my romance did, when I re-read some of its pages. There was a boy in it, not a handsome boy, but one endowed with all the virtues; an unhappy boy—my portrait, you may well suppose—about whom people disputed, and whom folks made suffer, because of a certain heritage. There was also a Count de Varennes, very wicked; and a poor work-woman, very good, who sacrificed herself for the child. And there was a Duc de Richelieu, sumptuously dressed; there were young girls carried off, a nocturnal assassination in the snow, caves, festivals—oh, it was superb! In the end the villain was beheaded and the boy found his mother again.

Into my romance I put all the aspirations of my heart, that yearned with love and for love, without any real object; and not for anything in the world would I have shown my blue exercise-book to anybody, for amidst the romantic rubbish of the tale I had put down some of the secrets of my soul. It was with a kind of shame and modesty that I concealed what I had written; but I got a scare one day.

I was writing away at my wonderful story when suddenly the usher got out of his chair. He came towards me; perhaps he had seen the frightened gesture with which I tried to hide my blue exercise-book. He stopped in front of me, remaining motionless and mute; not stirring myself, my head held down, I felt a cold gaze poured upon me. Then between the book and my face came a hand—a big red hand with black-edged nails—and it lifted up my blue exercise-book in air.

I dared not stir, I kept my head down, I waited. That was a terrible minute. Then the ugly hand reappeared, and I could have kissed it in my gratitude, for it laid back in front of me my blue exercise-book—my romance.

From that day I felt for the usher a profound affection, and at night, in my prayers, I used to ask God to bless him. . . .

At length my romance began to finish. Many times the usher, passing in front of me, would pick it up and read in it, but always he put it back without a word. I was no longer afraid of his intervening hand; on the contrary, it encouraged me to continue, it seemed to approve what I was doing, and to give me confidence. And at the end of two months I wrote, in red ink and roundhand, the great word "Finis."

To do that was at once a thing delicious and sad; something of a recompense and somewhat of an adieu. "Finis;" the crowning, but also the abandoning. I looked at the red letters sadly; even so young I had come to know the melancholy of an ended effort.

Then suddenly I heard my name—my proper name, Benoit—called out harshly. "Benoit!"

Immediately I understood that there was danger.

"Benoit, bring that to me!"

My old terror of the usher reappeared. "This, sir?" I showed him a paper.

"No, the exercise-book!"

Feigning still, I took up a black exercise-book, but the sardonic voice insisted, "The other, the blue one!" Tremblingly I obeyed. My legs bent under me as I approached the table. The usher took my precious book from me, and said "Go back to your place!"

I was hardly in my place again before I heard—oh, sound atrocious and cruel!—the tearing of paper.

I dared to look up. The usher had torn out of my blue exercise-book the first leaves, and to show me the better what he was doing, he shook them in the air, grinning the while. He took them between his hands, and then, never taking his eyes off me, he slowly tore the pages across. Then he put the fragments together and tore them in four, doing all this very markedly and slowly.

I looked at him piteously, my eyes full of tears—the poor supplicating eyes of a dog that has done no harm knowingly.

Then, the leaves being torn in four, he tore them again in eight. Then, in order to tear them into sixteen pieces, he made two heaps of the fragments, equalising the heaps with a care quite meticulous, and gloating at me all the while.

I put my hands together beseechingly. He smiled, finished equalising the morsels, tore them, equalised the fragments of them again, and then, putting out his hand above the waste-paper basket, the white little squares fluttered down, like butterflies dead.

Then he tore out two more pages; but I hid my face in the crook of my arm not to see any more, and to stifle my sobbing.

During nearly an hour he continued to tear, with slowness and precision, and enjoyment of his power of punishment, my offending blue exercise-book, my poor dream of romance. . .

Lectures on School Hygiene.—A course of lectures on hygiene in its bearing on school life has been arranged by the Royal Sanitary Institute, to commence on Monday, February 19, at 7 P.M. The course will consist of Lectures and Practical Demonstrations on (*a*) Personal Hygiene—Physiology; Foods and Diets; Clothing; Physical Exercise; School Accidents; Infectious and Parasitic Diseases; (*b*) School Buildings and Equipment—General and Structural; Drainage and Disposal of House Refuse; Ventilation; Warming and Lighting; School Furniture; and Physical Conditions affecting Health in School. The various subjects will be dealt with by well-known authorities, and will be illustrated by diagrams, models, and lantern slides. A nominal fee of 5s. will be charged for the course.

BY MANY HANDS.

"Quot homines, tot sententiæ."

WE are glad to see that the Federation of Teachers in Pupil-teachers' Central Classes has issued a counterblast to the innuendoes contained in the "Special Reports on the papers worked by candidates at the King's Scholarship Examination, 1904." A very carefully prepared memorandum has been issued pointing out the inconsistencies and fallacies in the "Special Reports." The Reports state that the results of the examination were not satisfactory as a whole, and with this statement probably most people will agree. They then state it as a fact "that the large majority of candidates at the examination are pupil-teachers at the end of their course of instruction." No figures are given by the Board of Education in support of this statement; but in refuting it the Federation shows that the total number on the roll of Centres is 16,500, and as this includes three years of pupil-teachers and one or two of probationers, we find that the average number in each year attending Centres is about 4000. This, however, assumes that every one goes through a four years' course at Centre, but as large numbers are admitted for a shorter period, it follows that not more than a fourth of the 12,041 women who took the examination had passed through a complete course. Hence, so far from it being true that they formed "the large majority," it is probable that the great majority never entered a Centre at all.

The Attack on P. T. Centres.

The memorandum sets out at length the papers given in French and in Mathematics for the sake of comparison, and thus upsets the examiner's presumption that the two-fifths of the candidates who took French "were not the worst two-fifths," for a thoroughly good student of French who knew a little Mathematics would be very foolish to attempt the French paper if his object had been to score marks.

The memorandum concludes by pointing out certain insidious remarks about secondary schools, and shows by quotations from the reports on the Oxford and Cambridge Local Examinations that there are among the secondary schools some which are less fitted for the training of teachers than are the Pupil-teacher Centres. It certainly seems a great pity that while the Board of Education is using the high quality of the instruction given in the Centres as an argument for refusing to accept a Matriculation course in the Training Colleges, it should sanction the issue of Reports containing such insinuations against the Pupil-teacher Centres.

THE Association of Assistant Masters in Secondary Schools had a most successful meeting at St. Paul's School. The great draw, or *le clou*, as our French friends would say, was the address by Lord Roberts on Military Training in Schools. The courage of the gallant Field-Marshal, which sustained him on his celebrated march to Kandahar, was evident when in the premier classical school he boldly suggested that it would "be better to devote the time spent in acquiring classical knowledge, which is at the best a doubtful help in after life to the individual and none whatever to the State, to develop the schoolboy's body and intelligence by military training and study of modern history, science, and geography, and to strengthen his character by habits of discipline."

Teaching the young idea how to shoot.

He recognised that one of the first qualities in a modern soldier is the ability to shoot straight, and this, like all other powers which depend on a co-ordination of hand and eye, should be acquired early in life. He therefore considered that boys should learn rifle-shooting at ten years of age. If proper rifles were not available, let the boys use air-guns; he said that he had tried them himself and found that they shot very accurately.

Canon Lyttelton, the headmaster of Eton, gave an outline of the scheme he hoped to have at work in his own school shortly for compulsory rifle-shooting in large schools.

While we bear in mind the story from which arose the saying, "There's nothing like leather," we must confess that the subject advocated by Lord Roberts has much more to recommend it to teachers than many others that have found their way into the curricula of our schools.

WE are promised some important changes in our educational enactments, and very naturally are anxious to know what they will consist of. No doubt the first will be an increase in the number of representatives of the ratepayers on the management of "non-provided" schools. It always seemed a pity, and a piece of bad policy into the bargain, that the clerical advisers of the late Government did not offer to accept a majority of the people's representatives from the first. If the management of each school had been vested in the hands of six members, two appointed to represent the "foundation" and four to represent the ratepayers, all would have been well. Of the four representatives of the ratepayers, two at least should be directly elected by the ratepayers in the immediate neighbourhood of the school. If the vicar had in the past proved himself a satisfactory manager, there would be little doubt that he and his nominees would be directly elected, but if he had not proved himself worthy of the trust, then the sooner the school passed into other hands the better.

Educational Reforms.

But there are administrative changes as well as legislative changes that we hope to see introduced. Of all the Government departments the Board of Education is the one in which perhaps patronage is accountable for the largest share in the appointments that should go by merit. Unfortunately in the past these have hardly been looked upon as rewards for past services, and we can even infer that service in elementary schools has been made a positive bar to recent appointments to the inspectorate. We trust that this will be remedied by Mr. Birrell and the new Parliamentary Secretary, Mr. Thomas Lough, and that caste and class prejudices will be abolished from all dealings with scholars and teachers.

N.U.T. NOTES.

OF the many deputations received by the Executive during my eleven years' work at Russell Square, that from the Teachers' Guild of Great Britain and Ireland was decidedly one of the most interesting. Its *personnel* comprised Professor Butcher, Chairman of the Guild, and a distinguished Professor of Greek, who, despite his elevated position, is *au courant* with all professional topics, Mr. Francis Storr, one of the founders of the Guild, and editor of the *Journal of Education*, and Mr. H. B. Garrod, M.A., Secretary, a cultured and delightfully convincing speaker. The object of the deputation was to ascertain whether the Executive favoured the idea of friendly co-operation of the members of the Union with those of the Guild, and a suggestion was thrown out that possibly arrangements could be made to allow members of the N.U.T. to join the Guild at a reduced subscription. The Organisation Committee to whom the subject was remitted for consideration wisely declined to entertain the proposal of the reduced subscription, but recommended that a circular letter be issued to all local associations pointing out that the Teachers' Guild have almost invariably been in agreement with the policy of the N.U.T., that relations of friendship and co-operation exist between the Executive and the Council of the Guild, and that the Executive hope that where a branch of the Guild exists within the area covered by a local association, it should be considered as no antagonistic body, but on the contrary as a friendly organisation, and that members of the Union in that locality would do well to become active and amicable members of the Guild. Were there such a branch in the city where I labour I should immediately and unhesitatingly follow the counsel now given from our headquarters. Through the courtesy of Mr. Garrod, I am in possession of the Guild's Articles of Association, and I observe that amongst the individuals qualified for membership are:

The Teachers' Guild.

> "Persons who are not teachers but who are anxious to promote one or more of the objects of the Association, and who contribute at least such annual sum to the funds of the Association as the Council shall from time to time determine to be the minimum annual subscription to the Association."

Another article states that "A Member may compound for all subscriptions for life by a single payment of £10," which recalls to my mind an attempt made, many years ago, to introduce this principle of Life Members into the Union by Mr. F. B. Gill, B.A., and the late J. C. Horobin, M.A.—an attempt, however, which did not commend itself to the Executive of the early "nineties."

REPRESENTATIVES at the Llandudno Conference will remember with what resolution and determination Mr. Bowers defended the work of the Examinations Board at a time when the ruling *motif* seemed to be to "close down" everything which did not pay its way financially. The poor despised "Library" had received its *coup de grâce*, and the Examinations Board seemed likely to share its fate, when first Mr. Bowers and lastly Mr. Waddington prevented the fatal *dénouement*. The situation was ultimately saved by the President giving an undertaking that a full report of the work and future of the Examinations Board should be presented for consideration by the next Conference. That report is now ready, and is, I must acknowledge, a forcible and powerful production. Perhaps I had better make the frank confession that I was personally never very "keen" about this Board. I remained silent when its advocates and enthusiastic supporters built their *chateaux en Espagne*, outlined their professional Utopia, that through its agency the Union might eventually become the examining body for the teachers' certificate. I'm not sure that even the enthusiasts now cling to the certification idea, but, whether this be so or not, their report supplies evidence of so weighty a character that I venture to prophesy that the Scarborough Conference will let the good work already done continue. Statistics are furnished which show how the Board's operations have extended in every direction, with the single exception of the periodical examinations of pupil teachers. The decrease in the entries since 1902 has been occasioned entirely by the fact that under the Education Act, 1902, P.T. Centres have been formed in almost every district, and consequently the necessity for the periodical tests by the Examinations Board has ceased to exist. One paragraph of the report which impressed me considerably runs: "The Examinations Board has won much favour with public authorities, being regarded by them as a complete proof that the Union is not merely a professional organisation, and as perhaps the most definite instance that can be put forth of the Union's devotion to educational reform. In that respect, therefore, the existence of the Board is a valuable asset on the credit side of the Union, even though in the balance-sheet it is so far responsible for some financial deficit." The Scarborough Conference will have to decide it. Increased prestige to the Union is worth £194 per annum, and there can surely be no manner of doubt about the result.

The Union's Examinations Board.

SINCE I left college, in the early eighties—and possibly long before—the *bête noire* of service in the denominational schools was compulsory extraneous tasks, which tended to make the teacher's life a misery and weariness of the flesh, and the teachers themselves mere chattels and dependencies of the vicarage and rectory. The parliamentary discussions on the 1902 Education Act did much towards the emancipation of the "voluntary" teacher, and led directly to the introduction of Article 15 (a) of the Code, stating, as every one now knows, that "a teacher shall not be required to perform any duties except such as are connected with the work of the school, or to abstain, outside the school hours, from any occupations which do not interfere with the due performance of his duties as teacher of the Public Elementary School." This Article appears clear enough, even to the meanest intelligence, yet, since its insertion, unscrupulous or careless managers have not hesitated to include in their advertisements of vacancies in non-provided schools an intimation that the successful applicant will be required to play the organ in church, or teach in the Sunday School, or perform some other task quite unconnected with the work of the school. For a long time neither questions in the House of Commons nor direct appeals to Sir William Anson seemed likely to be effective in eradicating the

The Coup de Grâce to Extraneous Tasks.

scandal; but I am glad to think that, on the eve of his departure from Whitehall, Sir William caused to be issued to Local Education Authorities and Managers of Non-Provided Schools, Circular 525, the terms of which are so clear and unequivocal that the victory for "the liberty of the subject" (such "subject" being the teacher) can now be regarded as finally won. The explicit threat that any breach of its provisions "may involve a refusal by the Board to recognise a teacher, and further may even disentitle the school to further recognition as a Public Elementary School," to say nothing of a permanent suspension of any recalcitrant school correspondent, will assuredly and effectually squelch an obnoxious and most impudent practice. The Board of Education are, at last, in earnest concerning this matter, and the teachers of the country must do the rest to make their freedom complete for all time. Personally, I regard the action of a teacher who conveys *before* his appointment any intimation of his willingness to undertake extraneous work to his prospective employers as absolutely unprofessional. *After* his appointment on purely educational grounds he is, of course, perfectly at liberty to use both his talents and his leisure in the manner most congenial to himself. *Chacun à son goût!*

* * *

A Yorkshire Re-Organisation Scheme.

FOR the past year or so strenuous attempts have been initiated by the North and East Riding of Yorkshire County Associations to bring about some re-organisation of the N.U.T.; and inasmuch as these attempts are the direct result of an intense desire to make the Union a more efficient instrument for the advancement of the cause of education, and the position of the teacher, they should command the respectful consideration of every Unionist. So far as I am able to understand the proposals, they suggest:—

(1) The recognition of County Associations as an integral part of the Union.

(2) The devolution of some of the work of the Executive to County Associations.

(3) The reduction of the present size of the Executive.

Of course, County Associations are already recognised "as an integral part of the Union"; but my impression is that the promoters of the scheme wish to *compel* every local association to be affiliated with the County Association to which, geographically, it properly belongs. This is an eminently desirable object, and one cordially hoped for by the authorities at Russell Square, though our policy has been to "hasten slowly" in the matter, and trust to time and the obvious advantages of such a course to work out the wished-for consummation. No conceivable benefit can be gained by trying to "rush" it, more especially as the metropolitan associations are, at present, either lukewarm, or directly hostile to the project. With regard to the second point: "The devolution of some of the work of the Executive to County Associations," it is easy to assent to the general principle. The difficulty begins when the question is asked: What work, other than that of Organisation, *can* be remitted? The Law and Tenure work must be retained at headquarters, and so must most of the Education Committee's work—unless it be proposed to furnish a set of expert officials and advisers to each County Association. "The reduction of the present size of the Executive" has my sincere and wholehearted support, and is likely to be attained without calling into existence new machinery still more cumbrous and much more expensive. 'Tis an old wheeze to charge the members of the Executive with being "out of touch" with the members of the Union, and with having "no settled policy" on the various professional and educational questions of the day. Every active, thoughtful, earnest Unionist holds these views at some time or other in his career, and the Executive are none the worse for a little bright, pungent, sparkling criticism occasionally. A. C.

NOTES FROM THE NORTH.

The E.I.S. Congress.

THE Thirty-Second Annual Congress of the Educational Institute of Scotland was, on the invitation of the Carnegie Dumfermline Trust, held in Dunfermline. Perhaps no provincial town richer in historical associations could have been found in Scotland, and it was a pity that the weather during Congress days was so unpropitious as to prevent many of us from visiting some of the scenes connected with the important events in Scottish history. Thanks to the munificence of Dr. Carnegie, the town possesses advantages of a unique character, and its latest acquisition, the College of Hygiene and Physical Training, in which the Carnegie Trustees held a reception for the delegates, is a building of which even our largest city might be proud. As was to be expected, the Congress was exceedingly well attended, the papers in many cases were of a high order, and the general excellence of previous Congresses was fully maintained. Perhaps the only drawback, and that a serious one, was the inadequate hotel accommodation. For the first time in the history of the Institute the Congress continued for three days. If, as many of us thought, the purpose of this innovation was to allow of fuller and freer discussion from the audience, it cannot be said its object was attained, for this year, I believe, there was less discussion than in former years. This was in large measure due to the crowded programme, a fault which seems to be increasing with the progress of years. Until there is at each sederunt only one paper read the grievance will not be rectified, and the loss, I venture to say, is the Institute's.

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The President's Address.

THE President, Mr. William Service, M.A., B.Sc., High School, Coatbridge, contrary to expectation, did not deal with educational politics, and thus in the opinion of many of those present missed a golden opportunity. The near approach of a General Election appeared to many a most opportune time for re-stating the demands of teachers with reference to the pressing problems of the co-ordination of primary and secondary education, of securing better tenure, for formulating the Institute's policy with regard to the training of teachers, and for demanding more adequate superannuation allowances. He contented himself with the subject of method in teaching, which in his opinion had received of late considerably more attention than in the Result days. There was a danger, he thought, that with the swing of the pendulum in the direction of freedom in educational aim and effort it might receive more attention than it deserved. There was a sense in which a teacher's method was the most impor-

tant thing about him, was, in fact, the essential source of his power and influence. In this sense method was nothing less than his entire character displaying itself in his work. It was the working expression of his personality, his general way of imparting his own intellectual life to his pupil. Too much stress could not be laid on method, thus understood. But when method had reference to the details of procedure and was a name for the easily divulged secret of machinery, there was a danger of making a fetish of method. How a thing should be done could seldom be dogmatically determined. Frequently there was a choice of method to accomplish an end, and, once given, a choice (at least to the trained worker) should in very rare circumstances be restricted by any external authority. The wise supervisor, out of the fulness of his wisdom, suggested, he seldom dictated. *What* we ought to teach, Mr. Service thought, was a matter of much more moment than *how* we ought to teach it. He deprecated obstacles being placed in the way of many of the schools of Scotland to continue the long established and highly honourable connection with the universities. He then instanced the case of teaching a modern foreign language as showing that what we should teach was of more importance than how to teach it. He contended for reading and writing mainly as the course for our pupils, and was strongly of opinion that *multum non multa* should be the aim of our schools. It was evident that many of the audience did not see eye to eye with the President in some of his remarks, but when he touched on the much vexed question of too many inspectors he struck a note in which all were in evident agreement.

DR. DICKIE, Secretary to the Board of Examiners, in proposing that the degree of Honorary F.E.I.S. should be conferred on Lord Elgin, Secretary for the Colonies, referred to the fact that there were three members of the present Cabinet Honorary Fellows of the Institute, namely, the Prime Minister, Sir Henry Campbell-Bannerman; the Secretary for War, the Right Hon. R. B. Haldane; and now Lord Elgin. He regretted that owing to the exigencies of the political situation Lord Elgin was not able to be present to receive the degree. It was accordingly agreed to hand the diploma over to the Fifeshire Branch to present it to his lordship at his convenience. The diploma states that it was conferred on him because he had rendered signal service to the cause of education as Commissioner on Endowments for Secondary Education in Scotland, Emeritus Viceroy of India, and as a wise and trusted counsellor in matters of Church and State.

Honorary Degree for Lord Elgin.

THE President, in introducing the representatives of England and Ireland, said it was a pleasant and profitable thing that the three teachers' organisations should thus annually fraternise. Mr. Flavell, Birmingham, on behalf of the National Union of Teachers, said it afforded him great pleasure to convey the heartiest greetings of the N.U.T. to the Scottish teachers, and to congratulate them on their increasing success. The cordial relations between the two associations were not only exemplified by this exchange of courtesies, but because their representatives, when questions involving the interests of both, on which it was desirable on account of identity of interests that a common platform should be adopted, were in the habit of meeting each other. So recently as last month, representatives from the Institute met representatives of the Union to discuss the very important question of Superannuation, and he trusted that the result of the Conference then held would be that the teachers of England and Scotland would come into line in order that they might bring the right pressure to bear at the right time to improve the at present very inadequate pension allowance. He then referred to the great progress made in education as the result of the English Act. The only disturbing element apart from the religious difficulty—which existed only on the political platform—was the wail of the heavily burdened ratepayer, more especially where the number of working-class children to be educated was large and the rateable value was very low in comparison. If something were not done in the immediate future to equalise the incidence of the rate for educational purposes, he very much feared that a reaction would set in and put back the educational clock for a time. Mr. Blenkinsopp, Leeds, was the other delegate. He had an opportunity at the Class Teachers' Breakfast of conveying the good wishes of the N.U.T. On behalf of the I.N.T.O. Mr. Ramsay and Mr. Murphy offered their warmest greetings to the Institute.

Foreign Delegates.

DR. GEORGE DUNN, H.M.I.S., in dealing with this subject, said that the period of a child's life, covered by the Supplementary Courses between the ages of twelve and fourteen, was a very important one. The Supplementary instruction gave complete and practical application to all the instruction already received, and provided a suitable mental equipment for the actual duties of life and the healthy and pleasurable exercise of the intellectual faculties. There was no doubt an earlier stage, during which the cultivation of the intellectual powers alone was aimed at when a child's mind was treated potentially rather than practically. In the Supplementary Courses Latin was learned, not because it was a *lingua franca*, but because it provided culture, expanded the intelligence, and facilitated the study of modern languages. Such subjects were, so to speak, disinterested; they contemplated the growth of the individual man, not the special requirements of a special profession or trade. A time came in the primary and secondary school when instruction of a practical kind was superadded to or interwoven with the training of the intellect. It would be a serious mistake to suppose that the cultivation of the individual mind and its adaptation to future requirements were either mutually exclusive or antagonistic. Most of the defects of education were due to the suppression or undue preponderance of the one or the other. The one was the fruit, the other was the flower, and practical efficiency was produced by general culture. Critics alleged that the cultivation of the intellect in the Supplementary Courses was subordinate to utilitarian objects, but the courses in the Code were not of cast-iron rigidity. These courses presumed continuance of instruction for at least two years, and it was distributed over that period so that the training might be deliberately and methodically conducted, without haste, without rest, and without

Supplementary Instruction in the Primary School.

compressing it in a single year. The instruction must be objective, demonstrative, and experimental. The courses were a discipline of the intelligence rather than the accumulation of a stock of useful information. The study of English was assumed to be an adequate instrument of literary culture at such a stage. In too many cases English was the Cinderella of the school curriculum. The world of thought and imagination, however, was too circumscribed for the development of our powers, and true culture involved much more than literature—it demanded the perception of scientific law. What was wanted was the habit of close observation, of exact reasoning, of detecting general principles, which could only be adequately acquired by scientific training. He then dealt with needlework, cookery, laundry and wood work, and showed their place in the school curriculum.

COUNCILLOR GULLAND, a member of the Edinburgh School Board, and Liberal candidate for the Dumfries Burghs, proposed the following resolution:—That any legislation for the improvement of Local Educational Administration should provide for (1) One Local Authority for Primary and Secondary Education; (2) Larger Administrative Areas. In supporting the resolution he said there were two very simple points—area and co-ordination, but under these two points lay practically the whole question. They did not say the new area must be the county or the district; they left that an open question. There were great advantages for the purpose of rating in an area which was already a rating area, or a combination of existing rating areas. Taking a quotation from one of Herbert Spencer's works with regard to co-ordination, namely, "By making co-ordination the specific characteristic of vitality, it involves the truths that an arrest of co-ordination is death, and that imperfect co-ordination is disease," he showed that this was equally applicable to the question of Education. Then the authority should be an *ad hoc* authority. It should be a School Board or Education Board, and not a Town or County Council. The resolution was seconded by Mr. S. M. Murray, Organising Secretary of the Institute. With this the proceedings of the first day terminated.

Educational Areas.

DR. MORGAN, Rector, Church of Scotland Training College, Edinburgh, took for the subject of his address, "Scottish University Reform." The State, he said, by granting charters to the universities, and partially supporting them, made them State institutions, and as such they could not remain uninfluenced by the reforms that had taken place, or were about to take place, in primary and secondary schools. A growing movement for university reform had arisen both within and without the universities. The first reform necessary was that each university should be granted the maximum of individual freedom consistent with due consideration for the interests of the sister universities. Other reforms referred to were the desirability of a three-term session, that work done in the class should count as part of the degree examination, and that the curriculum for the degree of M.A. should consist of five subjects, two of which should be studied for two sessions. The present arrangement of five and a half months for work and six and a half for vacation was certainly anomalous. Dissipation of energy on too many subjects was the great source of waste of human effort at the present day, and any reform that would give a training in concentration, accuracy, and thoroughness, deserved their warmest support. He argued that more time should be given to research. At present the Scottish universities almost entirely neglected this function, and this was the greatest weakness of our university system as compared with that of other countries. The Scottish universities were undermanned, and the consequence was that lecturing to large classes was the only method of teaching available. Individualism in education, as distinguished from collectivism, was one of the great contributions of the nineteenth century to education, and it was even more necessary in our universities than in our schools to deal with the students according to their ability and the amount of knowledge they possessed.

Scottish University Reform.

MRS. CREIGHTON, Hampton Court Palace, London, delivered an address on the "Need of Co-operation between Parents and Teachers." In the training of character, she said, if the teacher must do much, the parent must do more. The parents ought to be treated as fellow-workers with the teacher, not as fellow-pupils with the children; and though it might take them some time to accomplish that, she thought they might even recognise that there were some parents from whom teachers might learn something. The parents' point of view was not sufficiently represented in their educational authorities, and she was sure that fathers and mothers ought to be represented on the governing bodies. They wanted working women as well as educated women. If the teacher was to improve the physique of the child, he must not only know something about the home life of the child, but he must have the co-operation of the parent. Mrs. Bosanquet, St. Andrews, also gave an address on "Voluntary Work in Connection with Elementary Schools." At the conclusion of the sederunt Miss Isabel C. Hamilton, Vice-President of the Institute, moved the following resolution:—"That in view of modern requirements in education, there is urgent need for an increased supply of adult teachers, so that (*a*) the number of pupils on the roll for each certificated teacher may be reduced; (*b*) the heads of large schools and large departments be free for the work of supervision." A cordial vote of thanks to the speakers was given on the motion of Lady Helen Munro-Ferguson.

Co-operation between Parents and Teachers.

MR. A. SMALL, Convener of the Superannuation Committee of the Institute, proposed that further provision than the present inadequate one should be made for retiring allowances to Scottish teachers. This was seconded by Mr. Mudie, Dundee, and carried without discussion. Addresses were also given by Mr. John Mackay, Paisley, on "The Parent, the School, the Teacher"; by Mr. John D. Rose, Rothesay, on "The Place and Function of Higher-Grade Schools in Scottish Education"; and by Dr. Macdonald, Dunfermline, on "Transitional Stages in the Career of a Pupil." After which a resolution was passed to the effect that a

Superannuation.

uniform curriculum compulsory on all pupils cannot meet the needs of education in Scottish higher-grade schools, and that modifications should be permitted in the interests of exceptional pupils.

AS is the custom, there was a great round of social functions. The dinner was a decided success, though the speeches were in most cases none of the briefest. The Class Teachers' Breakfast, presided over by Mr. R. C. Munro-Ferguson, M.P., was by no means the least important function. The Ladies' "At Home," the receptions by the School Board, Carnegie Dunfermline Trustees, and the Town Council, were largely patronised, while the Assembly passed off with great *éclat*. Mention should be made of the tastefully-got-up Guide to Congress, generously presented by Messrs. Oliver and Boyd. Articles of great historical and educational value were contributed by the leading educationists of Fifeshire. The Fifeshire Branch of the Institute are to be congratulated on the success of the whole proceedings, and while every one worked hard for its prosperity, to the Chairman, Mr. Blackstock, and the Secretary, Mr. Peter Donald, are due the best thanks of all who attended Congress. Might I suggest to the Carnegie Trustees the desirability of publishing in booklet form the various addresses delivered at Congress? They have done this in the case of other addresses given by educationists, and it would be a most fitting and suitable memento of the Congress, to which they so hospitably invited the Institute.

Adjuncts of Congress.

R. D.

THROUGH INDIA WITH T.R.H. THE PRINCE AND PRINCESS OF WALES.

AFTER leaving Bombay, the Royal party proceeded to Indore, but by a rather circuitous route. The map will show that Indore lies on the northern edge of the Deccan plateau, and that the shortest way from Bombay by rail is across the north-west corner of the Deccan. The map also shows that the mountain range of the Western Ghats has to be surmounted, and then come the valley of the Tapti, the Satpura range, the valley of the Narbada, and the Vindhya range. This up-and-down journey has such steep climbs that the Royal train had to go by the easier route northward from Bombay, through Surat and Baroda, and then eastward to Indore. After this long journey the Prince had little to see except the people he had specially come to meet, for this part of the tour was made for political purposes.

Indore is the capital of one of the native states which form Central India. These are ruled by native princes, who are to some extent controlled by a British Resident. A large number of these princes with their retinues had gathered here to be presented to the Prince, and to offer him a gift as a formal tribute; and the only attractions to the sight-seers were these rulers, and especially their quaint followers. The country itself is an uneven, sandy plateau, with little vegetation, comparatively few inhabitants, and a very uninviting appearance; but just before the visit a transformation had taken place. A city of tents, with gardens, flowers, and every variety of decorations sprang up, and a most gorgeous array of inhabitants rapidly collected. The native magnates seemed to aim at presenting the most striking combinations, contrasts, and clashings of colour that were possible, and their followers made a suitable background. The escorts seemed to have come from the Middle Ages. Chain armour and hideous iron helmets were supplemented by cloaks and robes of all patterns and colours, and the weapons were equally remarkable—they might have been taken from a museum of antiquities. The natives, both great and small, are very particular about their due place and the honour that should be paid them on such occasions. The great had to be received and welcomed by a salute of a certain number of guns; the small were anxious for the dignity of a chair to mark them out from the unseated crowd, and all had to be given due precedence. The ceremony itself was quaint. The chiefs were presented in turn to the Prince, and offered their gift, which was merely touched; then the inevitable speech was made by the Prince — these speeches are the constant accompaniment of the tour; finally the chiefs were presented again for the Prince to sprinkle attar upon their hands and offer them spices. This concluded the "Durbar," as it is called, the first of a series which are an important, though rather tedious, feature of the tour.

Leaving Indore, the Royal party entered Rajputana, another portion of the native territory, and the home of the proud warrior race of the Rajputs, whose very name means "sons of kings." In this region there were three stopping-places — Udaipur, Jaipur, and Bikaner, each the capital of a native state. Sir Thomas Holdich, of the Indian Survey, says: "No towns or cities of India so amply repay a visit as those of Rajputana. There is nothing in India to exceed the beauty of Udaipur, seat of the most ancient of Rajput races, with the white brightness of its towers and terraces reflected in the waters of its still, clear lake, and its noble surroundings of hill and plain; nothing in the art of marble carving to beat the records of that race of sculptors which decorated Amber, the ancient site of Jaipur; nothing historically so fascinating as the blood-stained courtyards and walls and towers of Chitor."

The Prince's host, the Maharaja of Udaipur, claims to be descended from the Sun; his forefathers have been princes from time immemorial, and he is considered highest in rank and descent of all the rulers of India. Chitor is the ancient capital, with a history of heroic deeds dating back hundreds of years; for there the warrior race defied the Mohammedan invaders, were again and again defeated by the hosts of their enemies, yet ever rose again undaunted, preserving their independence until, nearly a century ago, they acknowledged British supremacy. Since that time they have been loyal to the Power which has given them protection, and in the dark days of the Mutiny they returned the service by affording shelter to English ladies. Now Chitor is the railway junction where the branch line runs off to the present capital, the beautiful Udaipur, which the King was unable to visit thirty years ago before the railway was constructed.

Udaipur—the "City of Sunrise" its name signifies—climbs up from the lowly houses of the poor, higher and higher, the houses seemingly piled one on the other, up to the shining white marble palace, which on the other side overlooks a lovely hill lake. Beautiful in the sunlight, it was enchanting when illuminated in honour of the visit. Hundreds of thousands of little

compressing it in a single year. The instruction must be objective, demonstrative, and experimental. The courses were a discipline of the intelligence rather than the accumulation of a stock of useful information. The study of English was assumed to be an adequate instrument of literary culture at such a stage. In too many cases English was the Cinderella of the school curriculum. The world of thought and imagination, however, was too circumscribed for the development of our powers, and true culture involved much more than literature—it demanded the perception of scientific law. What was wanted was the habit of close observation, of exact reasoning, of detecting general principles, which could only be adequately acquired by scientific training. He then dealt with needlework, cookery, laundry and wood work, and showed their place in the school curriculum.

COUNCILLOR GULLAND, a member of the Edinburgh School Board, and Liberal candidate for the Dumfries Burghs, proposed the following resolution:—That any legislation for the improvement of Local Educational Administration should provide for (1) One Local Authority for Primary and Secondary Education; (2) Larger Administrative Areas. In supporting the resolution he said there were two very simple points—area and co-ordination, but under these two points lay practically the whole question. They did not say the new area must be the county or the district; they left that an open question. There were great advantages for the purpose of rating in an area which was already a rating area, or a combination of existing rating areas. Taking a quotation from one of Herbert Spencer's works with regard to co-ordination, namely, "By making co-ordination the specific characteristic of vitality, it involves the truths that an arrest of co-ordination is death, and that imperfect co-ordination is disease," he showed that this was equally applicable to the question of Education. Then the authority should be an *ad hoc* authority. It should be a School Board or Education Board, and not a Town or County Council. The resolution was seconded by Mr. S. M. Murray, Organising Secretary of the Institute. With this the proceedings of the first day terminated.

Educational Areas.

DR. MORGAN, Rector, Church of Scotland Training College, Edinburgh, took for the subject of his address, "Scottish University Reform." The State, he said, by granting charters to the universities, and partially supporting them, made them State institutions, and as such they could not remain uninfluenced by the reforms that had taken place, or were about to take place, in primary and secondary schools. A growing movement for university reform had arisen both within and without the universities. The first reform necessary was that each university should be granted the maximum of individual freedom consistent with due consideration for the interests of the sister universities. Other reforms referred to were the desirability of a three-term session, that work done in the class should count as part of the degree examination, and that the curriculum for the degree of M.A. should consist of five subjects, two of which should be studied for two sessions. The present arrangement of five and a half months for work and six and a half for vacation was certainly anomalous. Dissipation of energy on too many subjects was the great source of waste of human effort at the present day, and any reform that would give a training in concentration, accuracy, and thoroughness, deserved their warmest support. He argued that more time should be given to research. At present the Scottish universities almost entirely neglected this function, and this was the greatest weakness of our university system as compared with that of other countries. The Scottish universities were undermanned, and the consequence was that lecturing to large classes was the only method of teaching available. Individualism in education, as distinguished from collectivism, was one of the great contributions of the nineteenth century to education, and it was even more necessary in our universities than in our schools to deal with the students according to their ability and the amount of knowledge they possessed.

Scottish University Reform.

MRS. CREIGHTON, Hampton Court Palace, London, delivered an address on the "Need of Co-operation between Parents and Teachers." In the training of character, she said, if the teacher must do much, the parent must do more. The parents ought to be treated as fellow-workers with the teacher, not as fellow-pupils with the children; and though it might take them some time to accomplish that, she thought they might even recognise that there were some parents from whom teachers might learn something. The parents' point of view was not sufficiently represented in their educational authorities, and she was sure that fathers and mothers ought to be represented on the governing bodies. They wanted working women as well as educated women. If the teacher was to improve the physique of the child, he must not only know something about the home life of the child, but he must have the co-operation of the parent. Mrs. Bosanquet, St. Andrews, also gave an address on "Voluntary Work in Connection with Elementary Schools." At the conclusion of the sederunt Miss Isabel C. Hamilton, Vice-President of the Institute, moved the following resolution:—"That in view of modern requirements in education, there is urgent need for an increased supply of adult teachers, so that (*a*) the number of pupils on the roll for each certificated teacher may be reduced; (*b*) the heads of large schools and large departments be free for the work of supervision." A cordial vote of thanks to the speakers was given on the motion of Lady Helen Munro-Ferguson.

Co-operation between Parents and Teachers.

MR. A. SMALL, Convener of the Superannuation Committee of the Institute, proposed that further provision than the present inadequate one should be made for retiring allowances to Scottish teachers. This was seconded by Mr. Mudie, Dundee, and carried without discussion. Addresses were also given by Mr. John Mackay, Paisley, on "The Parent, the School, the Teacher"; by Mr. John D. Rose, Rothesay, on "The Place and Function of Higher-Grade Schools in Scottish Education"; and by Dr. Macdonald, Dunfermline, on "Transitional Stages in the Career of a Pupil." After which a resolution was passed to the effect that a

Superannuation.

uniform curriculum compulsory on all pupils cannot meet the needs of education in Scottish higher-grade schools, and that modifications should be permitted in the interests of exceptional pupils.

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AS is the custom, there was a great round of social functions. The dinner was a decided success, though the speeches were in most cases none of the briefest. The Class Teachers' Breakfast, presided over by Mr. R. C. Munro-Ferguson, M.P., was by no means the least important function. The Ladies' "At Home," the receptions by the School Board, Carnegie Dunfermline Trustees, and the Town Council, were largely patronised, while the Assembly passed off with great *éclat*. Mention should be made of the tastefully-got-up Guide to Congress, generously presented by Messrs. Oliver and Boyd. Articles of great historical and educational value were contributed by the leading educationists of Fifeshire. The Fifeshire Branch of the Institute are to be congratulated on the success of the whole proceedings, and while every one worked hard for its prosperity, to the Chairman, Mr. Blackstock, and the Secretary, Mr. Peter Donald, are due the best thanks of all who attended Congress. Might I suggest to the Carnegie Trustees the desirability of publishing in booklet form the various addresses delivered at Congress? They have done this in the case of other addresses given by educationists, and it would be a most fitting and suitable memento of the Congress, to which they so hospitably invited the Institute.

Adjuncts of Congress.

R. D.

THROUGH INDIA WITH T.R.H. THE PRINCE AND PRINCESS OF WALES.

AFTER leaving Bombay, the Royal party proceeded to Indore, but by a rather circuitous route. The map will show that Indore lies on the northern edge of the Deccan plateau, and that the shortest way from Bombay by rail is across the north-west corner of the Deccan. The map also shows that the mountain range of the Western Ghats has to be surmounted, and then come the valley of the Tapti, the Satpura range, the valley of the Narbada, and the Vindhya range. This up-and-down journey has such steep climbs that the Royal train had to go by the easier route northward from Bombay, through Surat and Baroda, and then eastward to Indore. After this long journey the Prince had little to see except the people he had specially come to meet, for this part of the tour was made for political purposes.

Indore is the capital of one of the native states which form Central India. These are ruled by native princes, who are to some extent controlled by a British Resident. A large number of these princes with their retinues had gathered here to be presented to the Prince, and to offer him a gift as a formal tribute; and the only attractions to the sight-seers were these rulers, and especially their quaint followers. The country itself is an uneven, sandy plateau, with little vegetation, comparatively few inhabitants, and a very uninviting appearance; but just before the visit a transformation had taken place. A city of tents, with gardens, flowers, and every variety of decorations sprang up, and a most gorgeous array of inhabitants rapidly collected. The native magnates seemed to aim at presenting the most striking combinations, contrasts, and clashings of colour that were possible, and their followers made a suitable background. The escorts seemed to have come from the Middle Ages. Chain armour and hideous iron helmets were supplemented by cloaks and robes of all patterns and colours, and the weapons were equally remarkable—they might have been taken from a museum of antiquities. The natives, both great and small, are very particular about their due place and the honour that should be paid them on such occasions. The great had to be received and welcomed by a salute of a certain number of guns; the small were anxious for the dignity of a chair to mark them out from the unseated crowd, and all had to be given due precedence. The ceremony itself was quaint. The chiefs were presented in turn to the Prince, and offered their gift, which was merely touched; then the inevitable speech was made by the Prince — these speeches are the constant accompaniment of the tour; finally the chiefs were presented again for the Prince to sprinkle attar upon their hands and offer them spices. This concluded the "Durbar," as it is called, the first of a series which are an important, though rather tedious, feature of the tour.

Leaving Indore, the Royal party entered Rajputana, another portion of the native territory, and the home of the proud warrior race of the Rajputs, whose very name means "sons of kings." In this region there were three stopping-places — Udaipur, Jaipur, and Bikaner, each the capital of a native state. Sir Thomas Holdich, of the Indian Survey, says: "No towns or cities of India so amply repay a visit as those of Rajputana. There is nothing in India to exceed the beauty of Udaipur, seat of the most ancient of Rajput races, with the white brightness of its towers and terraces reflected in the waters of its still, clear lake, and its noble surroundings of hill and plain; nothing in the art of marble carving to beat the records of that race of sculptors which decorated Amber, the ancient site of Jaipur; nothing historically so fascinating as the blood-stained courtyards and walls and towers of Chitor."

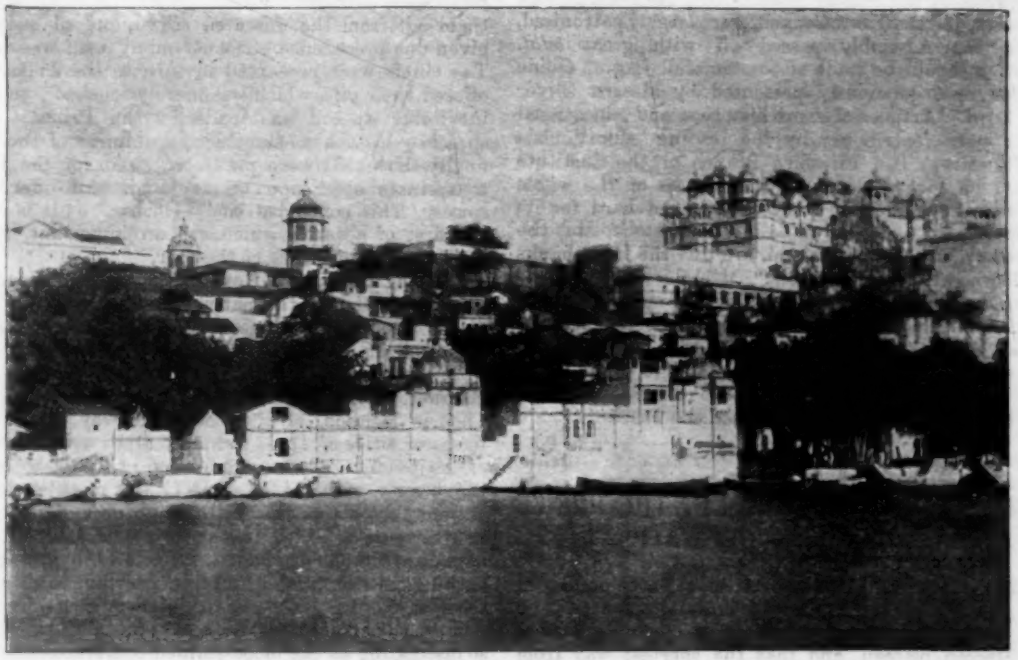
The Prince's host, the Maharaja of Udaipur, claims to be descended from the Sun; his forefathers have been princes from time immemorial, and he is considered highest in rank and descent of all the rulers of India. Chitor is the ancient capital, with a history of heroic deeds dating back hundreds of years; for there the warrior race defied the Mohammedan invaders, were again and again defeated by the hosts of their enemies, yet ever rose again undaunted, preserving their independence until, nearly a century ago, they acknowledged British supremacy. Since that time they have been loyal to the Power which has given them protection, and in the dark days of the Mutiny they returned the service by affording shelter to English ladies. Now Chitor is the railway junction where the branch line runs off to the present capital, the beautiful Udaipur, which the King was unable to visit thirty years ago before the railway was constructed.

Udaipur—the "City of Sunrise" its name signifies—climbs up from the lowly houses of the poor, higher and higher, the houses seemingly piled one on the other, up to the shining white marble palace, which on the other side overlooks a lovely hill lake. Beautiful in the sunlight, it was enchanting when illuminated in honour of the visit. Hundreds of thousands of little

lamps traced out the battlements and terraces, the arches and colonnades, in a soft sheen of silvery light; the perfect reflection in the lake beneath made a picture only to be equalled by that presented by the palaces and temples in the glory of the full moon. The lake is island-studded, bearing marble arcades and summer-houses upon its bosom, and the encircling hills lit up with great bonfires completed the scene.

Jaipur followed, the "Pink City," for the houses are washed with pink, a massive wall twenty feet high and nine feet thick defending it. It is a city of remarkable design for India, for the streets are very broad, even the lowliest, and are arranged at right angles to each other. One might call it a city of birds, too, for thousands of pigeons are to be seen perfectly tame in the streets, while more gaudily feathered birds are above in much greater numbers, and the kites are treated with care and courtesy as being sacred. There is a tank in which many alligators are kept, and also cages with tigers; for Jaipur is in a district where tigers are a scourge and tiger-hunting a popular sport. The city is in a dusty plain, as it is on the confines of the Thar, the Indian desert. The country here is poor, and famine is now threatening the land, for the rains have been scanty.

From here the Prince journeyed through the desert itself to Bikaner. The desert consists of a great tract of land between the Aravalli Hills and the Indus, and hence is about 250 miles broad. It stretches from the Rann of Cutch more than three-quarters of the distance to the Himalayas, and so is nearly 500 miles long. This immense area is almost perfectly flat, and may be described as an ocean of sand scarcely broken by little patches of vegetation, from which a few people get a precarious livelihood. The vegetation is partly scanty grass on which flocks and herds manage to exist, and so the people are largely shepherds and herdsmen wandering from one place to another in search of sufficient food. Also there are occasional oases, fertile patches which are watered by artificial means. Deserts are usually sterile, not because of the soil but for lack of moisture, and here, as elsewhere, if water is supplied the desert will become very fertile. Indeed this district, like the rest of the great plain, is formed of alluvial soil brought down by the rivers from the Himalayas, and the course of a great river which once helped in this work can still be traced through the State of Bikaner down to the Rann of Cutch. Like other deserts, too, this one is the home of camels, and this was to be seen at the entry of the Prince into the city, for one of the most striking features was the camel corps. The Maharaja of Bikaner, in common with the other princes of this part of India, has organised and supports a native army to aid in the defence of the Empire, and here there is a camel corps to which the Maharaja devotes much attention. Twice this corps has gone over seas, proving its own usefulness and the loyalty of its founder, first in China and later in Somaliland.



THE CITY AND PALACE OF UDAIPUR, FROM THE LAKE.

Yet in spite of this coming into contact with other armies, part at least of the native force is still clad in chain mail, and so has the mediæval appearance which seems to characterise the military part of these States. And here again the same contrast between new and old was seen; for electric lights illuminated the scene, and motor-cars took the Prince to his shooting some miles from the city. The neighbourhood is not one suitable for a Durbar; there are no great States near, and the lack of water and difficulty of travelling would also prevent the gathering of people—and so the visit was mainly occupied by shooting expeditions, grouse being the chief object of the sport.

From Bikaner the journey was continued northward to Lahore, the capital of the Punjab—*i.e.* the region of the "five rivers," the Indus and its tributaries, Jehlum, Chenab, Ravi, and Sutlej. The change from the sandy desert to the cultivated fields near Lahore is gradual, for much of the land between the rivers is dry and almost uncultivated. The rivers are a very important source of water, the rainfall being rather scanty and uncertain, and so it is only near the rivers or canals that the really fertile districts of the Punjab are found. Hence, also, the populous parts are near the streams, and the watered districts are marked by the density of cultivation and the frequency of villages.

Lahore stands near the Ravi River, and is not now so important or populous as it once was. There is a great difference between its two parts, the old and the new towns, but some of the old buildings have been spoiled by being used as Government offices. The magnificence of the old city is due to the Mogul emperor, Akbar (*i.e.* the Great), who was the grandson of the first Great Mogul. Some of the finest buildings of this part of India, and indeed of the world, are associated with this Akbar, his son Jehangir, and his grandson Shah Jehan, to whom we owe the Taj Mahal—of which more later. These three princes were great and wise rulers, and the palaces and tombs they built are enduring mementos of them.

The Prince did not now stay long in these plains of Northern India; they were to be visited at greater length later, for the north-west frontier, the back gate of India, was the next place on the programme. Peshawar and the Khaibar Pass were to be seen, and then again would the plains receive their Royal visitors.

First came Peshawar (whose name, by the way, rhymes with "flower"), the city of the high plains, overlooked and for ever threatened by the mountains. The threat is no idle one, for Peshawar stands in the gate of India—the place of trade, but the place of danger. It is by the Kabul River, which flows from Afghanistan to the Indus, cutting a valley through the bordering mountain ranges and affording the easiest route from Central Asia into the country. Trade and danger—these are the two ideas which seem to dominate Peshawar. It is a busy, thriving, teeming city, yet with narrow streets, a total absence of decoration, and encircling walls; the whole dominated by the fort on the one side and by an old palace with a high watch-tower on the other. For trade, it is the meeting-place of the caravans which cross the Khaibar and the merchants from the rich cities of golden India. Fruits from Kabul; carpets, shawls, and other brightly coloured fabrics from Persia; tinned goods, iron goods, tools and weapons, perhaps from England; sugar and many other products of India; all these meet here, and their owners exhibit no less variety. Peshawar itself, its trade and its people, are not Indian so much as cosmopolitan, or rather oriental, with the British troops and political officials giving a mere suggestion of the West. But Peshawar does more than trade; its small, bare, close-packed booths form a hive of industry where the men are making silver goods or beating silver rupees into rings, chains, or bangles—for in these forms the silver currency of the country is commonly hoarded. Elsewhere they are grinding grain, sifting flour, or making sweetmeats, or perhaps hammering out copper, or making waxcloth, that is, silk or some other textile, with white or gold designs in wax upon it.

The city seems to be huddled together in the dusty plain, fearing still the sack and ruin which time after time during thousands of years have come upon it; but there is less fear now than before, for the dread Pass is guarded, and two miles from the city is the military cantonment. This is very different in appearance and quite refreshing in comparison with the city.

It is laid out in broad thoroughfares, tree-shaded avenues, and bright gardens. In the cooler part of the year the climate here is a welcome change for the soldiers who have been in the lower parts of India, but the summer is unbearably hot. This contrast between summer and winter is still more marked in the Pass some miles westward and much higher; for if the winter cold there is great, the summer heat is dangerous. So it is with the difference between day and night; the setting sun brings blasts of cold air from the mountains, and the warmth only returns when the sun has been shining for some hours.

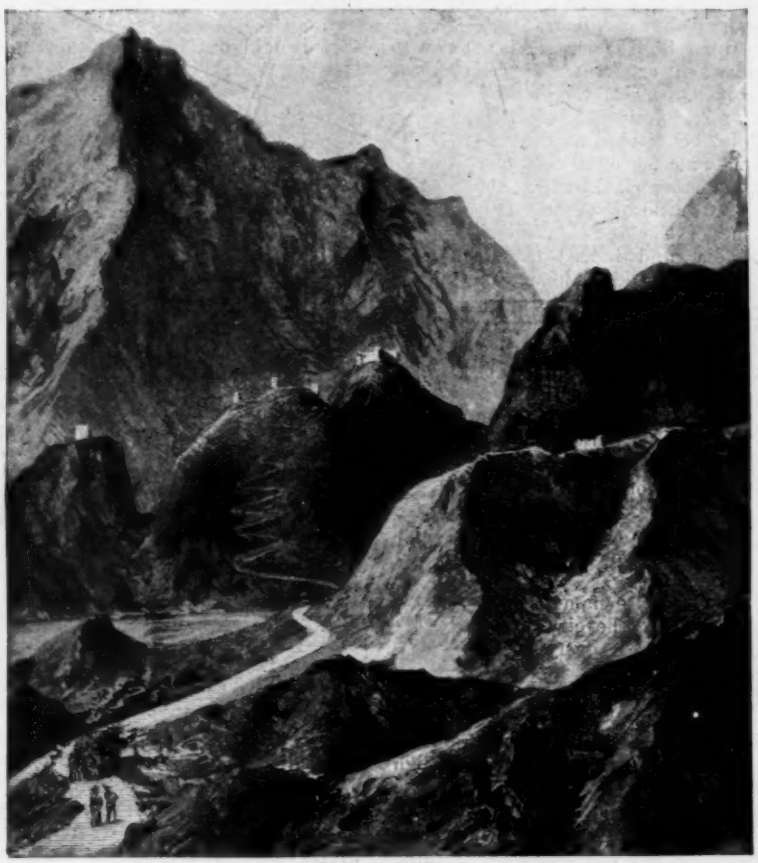
THE MAHARAJA'S COLLEGE, JAIPUR.

At Peshawar another Durbar was held, but the magnificence and display of the first were here replaced by simplicity and seriousness. The surroundings were simple, no throne but a chair was the Prince's seat; and the men were serious and grim-faced, men of the frontier whose lives mean watching and fighting.

Then came the visit to the Khaibar itself. The railway took the Royal party to Jamrud, a journey of nine miles, which brings one to the entrance of the Pass, where the walls of bare rock close in and narrow the road. Brown and barren, red and rugged, overtopping the road, blocking the way, rising height on height, terrace behind terrace, towering at last to the glittering snows, these chaotic masses seem to hem one in on every side. There seems no plan, no end to these

mountains; there is only one feature clearly to be marked—the Pass itself, and, seeing this, it is easy to realise the military importance of the road. It skirts no dizzy precipices, and in itself it lacks the difficulty of other passes elsewhere on the frontier; but in that easiness lies its danger, and this danger is accentuated by the fierce tribes of the surrounding country and the little valleys that open into it. Hence the pervading military spirit. The whole Pass is picketed and patrolled, and not the least among the defenders are the Afridis, the native hillmen (not Afghans) who now guard for the British the very region they so stubbornly contested against us a few years ago.

The Prince's personal escort when he left the train at Jamrud was composed of sixty-two of these Afridis, and along the route were nearly three thousand men, half being the famous Khaibar rifles. On ridges and peaks overlooking the road were sentinels, alone or in small groups, and here and there were small block-houses telling of the constant watching that is always necessary. There is not only the possibility of a great invasion that must be guarded against, but also the swift incursions of the hillmen with an inborn love of fighting and raiding. No danger appeared, however, during the Royal visit. The journey was comfortable save for the dust; for the road is well made, and this too is the work of the Afridis, of course under British guidance. The fort of Ali Musjid was passed, which stands high on a great mass of rocky ground, and at last was reached the fort and encampment at Lundi Kotal, taken by the Afridis, retaken by the British, and now the extreme end of the Indian Empire, giving on to the valleys and mountains of Afghanistan. Here there was a sham fight to show how warfare is carried on in such a country.



THE KHAIBAR PASS.

The special guarding of the Pass had been preceded indeed by a careful watching of Peshawar. Long before the Prince's arrival the city had been watched, the houses along the road to be traversed had been searched, and suspected persons were carefully kept out of the way; for Peshawar is naturally a centre of trouble and a meeting-place of turbulent and disaffected people.

The Khaibar is always guarded, and caravans are only allowed through on two days a week, for the safety of the traders themselves. Raids by some of the Afridis have recently occurred quite close to Peshawar, and rifle-stealing from the camps is a recognised and profitable sport among the mountaineers.

The Pass is a scene of great animation on the two open days; bullock carts and camel caravans jostle and mingle as the two streams from India and Afghanistan meet and pass—or attempt to pass, for the way is sometimes too narrow, and the rules of the road are not kept either with courtesy or strictness. However, the traffic at last gets through, and then again there is silence—the great silence of the mountains.

Behind the Pass lies the army, and it was the army that the Prince next saw when he returned from the Khaibar and Peshawar. The route lay through Attock, a strong fortress where the Kabul River runs into the Indus, built upon a high spur of land overlooking the river; but the Royal party proceeded to the great plain near Rawal Pindi, where the grand review and manœuvres were to take place. Delhi had been at first intended as the scene of these, but the usual consideration in India, the supply of water, led to Rawal Pindi being selected. This is just in the plain, about eight miles from the foot of the Himalayas, and there is here a large military station and arsenal. In the new organisation of the Indian army Lord Kitchener has arranged nine divisions for war purposes, of which three are in this extreme north-west, at Lahore, Rawal Pindi, and Peshawar respectively.

Three days' manœuvres were arranged, with the general idea of a southern army defending the position against a northern invader. The broken character of

the ground, especially in the immediate neighbourhood of the town, and the dust which was thrown up and covered the movements of the troops, hid much of the scene from the spectators. The review, too, was partly hidden by the dust, in spite of the efforts made by sprinkling water whenever and wherever it was possible, and by covering great areas with grass. Yet the march past, in particular, was impressive, especially from the character of the men, for British troops were working in concert with Sikhs of the Punjab itself, with Pathans from the mountains of the north-west, with Rajputs from the deserts to the south, and with Gurkhas from the mountains of Nepal, hundreds of miles to the south-east. Certainly these troops are among the finest fighters of the world, and the Indian army is probably

THE MOUNTAINS OF KASHMIR.

seen at its finest in the cavalry, and in the artillery whose guns thundered past at the gallop. In all, 55,000 troops took part in the review.

Again the plains were left behind and the Himalayas approached, when the Royal party turned aside to visit Jammu, which lies at the foot of the great mountains, almost surrounded by snow-clad heights. It is the capital of Kashmir, the native state that guards the frontier in the central part of the northern boundary. On the other side lie Russia and China, to which several passes give access, and therefore it is not surprising that the Imperial Service Troops (the general name for the forces of the native states kept for imperial purposes) are especially strong here. The famous Vale of Kashmir lies behind the first ranges of the mountains, only to be entered by the valley of the Jhelum, and in this valley is the old capital Srinagar. Jammu is the new capital, as it is found more convenient to have the centre of government on the Indian side of the mountains; but the Vale is still the favourite residence in the summer, when it is a refuge from the heat of the plain. A strange feature of the visit was afforded by some Buddhist priests from beyond the hills, who gave a so-called "devil dance," regarded by them in the nature of a religious ceremony.

Esperanto.—The attention of teachers who are interested in the attempt to found a new universal language is directed to a free demonstration course for teachers which the British Esperanto Association is about to open at its offices, 13 Arundel Street, Strand, London. As the days and hours will be fixed to suit the majority of intending members, all who would like to join a class for such a course are invited to communicate with the Secretary, Miss E. A. Lawrence.

THE LAW AFFECTING SCHOOL DISCIPLINE.

BY T. A. ORGAN, B.A.,

Barrister-at-Law, of the Inner Temple and the Oxford Circuit.

(*Continued from p.* 338.)

Who may Inflict School Punishments?—The reply to this question is based upon the general principle, which is the authority for all forms of scholastic punishment. As we have already stated, this general principle is the delegation by the parent to the schoolmaster of all or any of his (the parent's) powers to inflict chastisement on his child. If the express rules or the customs of the school permit punishment to be given by masters and teachers, other than the head, then the punishment is not illegal. The legal justification for such punishment is founded on the contractual relation which is set up between the school authority and the parent of the scholar. The one party to the contract is the school authority. That authority receives the scholar into the school and agrees that he shall be taught and trained. The other party is the parent, who agrees that this teaching and training shall be given in accordance with the rules and customs of the school. Among these rules and customs are included those which relate to the enforcement of school discipline, and hence the parent delegates the right to inflict punishment to the extent and by the persons recognised by the disciplinary rules.

So far as the present writer is aware, there is only one case in which this point has been discussed. In that case, although the punishment was given by one of the older scholars, it was held not to be illegal, because it was in accordance with the practice of the school. It arose out of an assault upon a scholar attending the Queen's Grammar School, Basingstoke. The defendant was a fellow-scholar, and the assault took place in the playground of the school. An information was laid, but was dismissed by the magistrates who heard the case. The father of the boy who was assaulted then applied to the High Court for a *mandamus* addressed to the magistrates, ordering them to state a case for the opinion of that Court. The affidavit of the magistrates reveals the circumstances of the case, and the grounds upon which they based their decision not to convict. In their affidavit they stated:—

> "From the evidence before us it appeared that the assault complained of took place in the playground of the Queen's Grammar School in this town, where the defendant and complainant were both pupils, and where the prefect system, as it is called, had, we understood, for a long time existed. Of these prefects the defendant was one. It was proved that the defendant did beat the complainant; but the justification set up was that the complainant had been guilty of a breach of school discipline in school, for which others of his class fellows had been obliged to suffer, and that the defendant as a prefect was authorised, under the rules and practice of the school, to chastise the complainant for the said offence. In support of this defence the headmaster was called, and he deposed that he had appointed the defendant as prefect, having confidence in him, and that part of the duty of a prefect was to protect young boys from ill-treatment or brutality in administering punishment out of school, so that a number might not thrash a single boy. This regulation he found to work very well; and in this particular case he said he had made an investigation, and that he endorsed and approved all that had been done by the defendant. Our attention was also drawn to the rules of the school, one of which is to the effect that,

subject to the regulations of the authorities, the discipline of the school is under the direction of the headmaster.

"As to the extent or degree of the beating, the surgeon to whom the boy was taken to be examined on the day of the occurrence, and who was called in support of the charge, admitted on cross-examination that the marks, though severe, were not excessive; that he had seen boys after a caning much worse than the complainant was, and that the marks he saw were only the ordinary marks after a whipping. After hearing the evidence on both sides we find, as a matter of fact, first, that the complainant had been guilty of a breach of school discipline; secondly, that the punishment inflicted upon him was in consequence of the said breach of discipline, as he at the time knew; thirdly, that the punishment was inflicted by the defendant acting as a prefect appointed by the headmaster, in accordance with a rule and practice of the school, well known to the complainant; and lastly, we were satisfied from the evidence of the boy himself, as well as that of the surgeon, that the said punishment had not been immoderate or excessive. We therefore dismissed the information."

The case was heard by two judges, who refused the application for a *mandamus*, with costs. In giving the decision of the Court, LUSH, J., asked whether the power of punishment could not be delegated, and whether the master must always inflict the punishment with his own hand. It had been done for ages in all schools, then could it be held that the infliction of a moderate punishment on a boy at a school was illegal, *merely because it was inflicted by a monitor?* MELLOR, J., in the course of a fuller judgment, said that "it might as well be argued that a boy at home could not be chastised except by his father—not by his brother, for instance. The master of a school could not be everywhere, nor do everything with his own hand. . . . There was nothing in itself unreasonable, necessarily illegal, in the infliction of punishment by 'prefects' or 'monitors,' though he did not desire to express a decisive opinion on the general question."

The Form of Punishment.—The particular manner of punishment is nowhere prescribed, but from what we have already stated, it is clear that care must be taken to avoid the use of any instrument which would be likely to cause permanent injury. In the case Reg. *v.* Hopley, it was said:—"Not only must the punishment not exceed the bounds of due moderation, but the instrument must be one proper for correction and not calculated to produce danger to life or limb. Should evil consequences to life or limb ensue owing to the use of an improper instrument, the parent or teacher inflicting the punishment is answerable to the law." If a father or schoolmaster correct a child, it must be with such things as are fit for correction, and such as are not likely to maim, the age and strength of the child being duly considered. (*Russell on Crimes*, vol. i. p. 773.)

In many instances the instruments of punishment are provided by the School Authority, and among those so provided are the cane, the tawse, and the birch. Scotchmen will not need to be told that the tawse is a leather strap, but its use is not common in English schools. The cane is the instrument most commonly used, and is generally recognised as proper and fit for the purpose.

In connection with this part of our subject, the question arises as to the part of the body upon which punishment may be inflicted. No specific rule has been laid down, but great care must be exercised in order to avoid blows on the head or any other part of the body liable to permanent injury, for if the punishment is calculated to produce danger either to life or limb, it is excessive and unlawful. In one case brought before the High Court it was decided that caning on the hand was not an illegal method of punishment. The headmaster of a Board School was convicted by a Metropolitan magistrate of an assault upon one of his scholars. The magistrate found as facts that the boy had committed a fault which properly called for corporal punishment, and that four strokes on the hand had been given with the cane. He then says: "I was of opinion that if caning on the hand was a proper method of punishment to adopt in the circumstances of the case, the punishment was inflicted unobjectionably. But I was also of opinion, that punishment by caning on the hand, however inflicted, was necessarily attended by risk of serious injury to the hand; that there were methods of corporal punishment quite as available, efficacious, and not necessarily attended by any risk, of which methods, if the schoolmaster had used due caution, one or another would have been substituted by him for that which he adopted, and that for these reasons caning on the hand was, in the circumstances of the case, improper, and ought not to have been inflicted." (Gardner *v.* Bygrave.) In giving the decision of the court, MATHEW, J., said:—

"The conviction must be quashed. The point of law put us is this: Is it, according to the law of England, criminal for a master to cane a boy by striking him on the hand? The magistrate states the boy deserved corporal punishment. He does not, as counsel for the respondent does, attack the right to inflict corporal punishment, when applied with a view to intellectual stimulation, for he states that there are other methods of corporal punishment 'quite as available, efficacious, and not necessarily attended with any risk.' However, he grounds his judgment on his opinion that caning on the hand is necessarily attended by risk of serious injury to the hand, but he finds as a fact that in this case it was unobjectionably inflicted, and does not find that any serious injury was caused by it. The magistrate was wrong in thinking that under these circumstances the possible risk made it criminal for the master to cane on the hand."

Punishment by Exclusion from the School.—Of all the forms of punishment this is the most serious, as it may brand a boy with disgrace for life. The law demands that the power of expulsion should be exercised with the greatest care, and even when the regulations of a school give to the headmaster sole discretion in this matter, the exercise of that discretion is subject to review by a Court if it lead to expulsion. In one of the cases to which reference has already been made (Hutt *v.* the Governors of Haileybury College), the lad Hutt was expelled, and damages were claimed not only for assault, libel, and slander, but also for an alleged breach of contract between Hutt's father and the Governors of the School, the breach being the failure of the Governors to retain the boy at the College for the purposes of education. Dealing with the question of expulsion, when summing up the case to the jury, FIELD, J., said:—

"He was prepared to hold that there was no such absolute discretion in masters of schools as that claimed in the Governors' statement of defence as was originally pleaded. Such a power would be far too great and dangerous, viz., that any boy at school should be liable to be branded for life by expulsion, simply because a master on his sole authority and discretion—however distinguished he may be—had come to the conclusion that such a course was necessary for the well-being of his school. Such an absolute discretion could never be permitted. All large bodies must, of course, be governed in the public interest, and in some cases such absolute discretion is necessary, but not in such a case as this."

In the older case of Fitzgerald *v.* Northcote, the subject was discussed, and the general principle enunciated in unmistakable terms. The judge said :—

> "It is incidental to the authority of a headmaster to expel from the school over which he presides any scholar or student whose conduct is such that he could not longer be permitted to remain without danger to the school. This, however, is not a power to be exercised arbitrarily, it may be questioned; and although no doubt a large discretion must be allowed, it must not be exercised arbitrarily or capriciously, and if it has been exercised unreasonably, then its exercise cannot be set up as a defence."

Punishment by Detention.—This form of school punishment is frequently resorted to by teachers, but their right to do so rests solely on the parents' delegated authority. Under ordinary circumstances every confinement or forcible detainer of the person is an imprisonment, and unless such imprisonment is effected by and under due authority, it is a misdemeanour at Common Law, and punishable by fine or imprisonment. But a father has the right to confine or detain his son in any particular place, provided the detention is not of such length or character as to amount to cruelty. The teacher has a similar right, but it can be withdrawn at any time by the parent. Hence if a child has been detained after the close of the school session, and the parent demands its immediate release, the teacher's right to detain no longer exists.

A curious point was raised in the High Court in 1884, when it was decided that, as the Elementary Education Acts do not authorise the setting of lessons to be prepared at home by children attending a Board School (now a public elementary school provided by a council), it is not lawful to detain a child after school hours for not doing home lessons (Hunter *v.* Johnson). In that case the child attended a school which was under the control of the Bradford School Board, and it was the practice of the teachers, in compliance with the directions of the School Board, to set home lessons for the children attending the schools. The mother of the child forbade him to do these lessons, and as a result the teacher detained him after the regular school hours. An information was laid for common assault against the teacher, and at the hearing the justices dismissed the summons, holding that no assault punishable had been committed. Against this decision the parent appealed, and after the case had been argued, MATHEW, J., said :—

> "The arguments of counsel have convinced me on both points raised. With reference to the first point, it appears that, having regard to the enactments and the bye-laws of the School Board, they have no authority to impose upon children the duty of studying at home. We are compelled to deal with the matter of education as a statutory interference with the liberty of the subject, and the statute must be construed in the ordinary way. I thought at first that it might be possible to treat this as a matter of school discipline, and within the powers generally exercised by persons in charge of the education of children. Ordinarily an important part of a child's education is the study at home, but here the child has been punished for disobedience of an order which the schoolmaster had no power to make. I had some doubt also as to whether the facts stated in the case amounted to an assault; but bearing in mind the notice that had been sent to the schoolmaster by the mother, and the fact that the child was kept in as a punishment and could not have got away, I think the case is brought within the authorities that have been referred to. It is therefore a case for a conviction and the infliction of a nominal penalty, and the case must be remitted to the magistrates accordingly."

It should be pointed out that this case does not decide that detention is an illegal form of punishment, but it does decide that punishment of any kind is illegal if inflicted on a child for not doing home lessons, and provided that child is in attendance at a public elementary school.

REPORT ON SECONDARY EDUCATION IN SCOTLAND.

Secondary Education.—The First Annual Report on Secondary Education in Scotland appearing over the signature of Dr. J. Struthers draws attention to the rapid and remarkable development which the system of inspection of secondary schools has undergone during the twenty years that have elapsed since its initiation by Sir Henry Craik, to whose conspicuous services in the cause of education Dr. Struthers pays deserved praise. In his historical survey he notes that the organisation, which began in 1886 with the inspection of 31 schools, has grown steadily, until in the present year as many as 110 schools applied for inspection. He next deals with the growth of the Leaving Certificate Examination, which in 1886 was participated in by 29 schools, while this year no fewer than 393 have presented pupils as candidates, in addition to 435 which have presented pupil-teachers only. Coincident with the growth of the system, there has been a steady advance in its efficiency, so that, while the position of secondary education in Scotland is still far from being what the highest interests of our country demand that it should be, in the last quarter of a century a great deal of ground has been gained.

Higher Grade or Intermediate Schools.—Speaking of the higher grade or intermediate school, he says that it should be borne in mind that within the last few years there has come into existence, under the operation of the Code, a new type of school that has a contribution of its own to make towards the education of the Scottish people. Intended to meet the needs of pupils who have to leave at fifteen or sixteen, this school aims at providing three, and possibly four, distinct annual stages of higher education beyond the qualifying examination stage. Secondary schools in the full sense of the term, however, provide at least five, and possibly six. The higher grade schools are for the most part developments of the more successful of the old parish schools. Realistic studies bulk more largely than they do in the traditional secondary course, although reasonable prominence is given to the literary side of the curriculum also. In 1900 the total number of higher grade schools was 31, in 1905 it has risen to 131, so that they now cover the country like a network, hardly a single county being without one.

Words of Warning.—On two points Dr. Struthers utters a word of warning. In the first place, it is but too evident, he says, that there is a tendency to employ these higher grade schools for a wrong purpose. The proportion of scholars who complete the full curriculum falls far short of what it ought to be. Many are enrolled who have no intention of remaining at school beyond fourteen. This matter is engaging the earnest

attention of H.M. Chief Inspector, with whom rests the responsibility of reporting upon the schools. In the second place, there is a lack of any approach to co-ordination of authorities. Where no fully developed secondary school is readily accessible, it is the obvious duty of managers to foster the most advanced instruction given in their higher grade school, so that this latter may be fitted to serve as more than a merely intermediate centre. On the other hand, where good secondary schools are already in existence, and where capable pupils can make their way to them by bursaries, the plainly marked out policy of the higher grade schools and of the secondary schools alike, is to work in the direction of co-operation. The peculiar function of each is sufficiently important and sufficiently honourable to claim a place for itself in the educational organism.

Statistics.—The Report shows that the number of secondary and preparatory schools inspected this year was 110. Under the Minute of April 27, 1899, £26,600 were allocated to 55 of these schools, as against £24,200 last year; while grants from committees of burghs and counties under Section 2 (1), (b) of Education and Local Taxation Account (Scotland) Act of 1892 amount to £23,175, 5s. 6d., and grants from Scotch Education Department for Science and Art reached the sum of £13,562, 0s. 4d., in all a total of £63,337, 5s. 10d., as against £57,611, 13s. 5d. last year. On the rolls there was a grand total of 18,076, against 17,921 last year, while the average attendance was this year 16,619 against 16,507 last year. The percentage of attendance this year is 91·9 as compared with 92 last year. Of the 18,076 on the rolls, 9400 were over fourteen years of age. This proportion shows a most laudable desire on the part of Scottish parents to give their children a better education.

Intermediate and Leaving Certificates.—The goal at which the secondary school aims is the leaving certificate, while that of the higher grade school is the intermediate certificate. This year 499 leaving certificates have been awarded, as against 403 issued last year, while the number of intermediate certificates gained has risen similarly from 749 to 841. With respect to the various kinds of special certificates, the results up till now have not been encouraging. The primary conditions attached to the special certificates are (1) that all pupils who propose to enter upon the course should first have reached a certain standard of general education, this standard as a rule corresponding to what may be roughly called the stage of the intermediate certificate; and (2) that the course itself should have been approved by the Department as well adapted to the purpose it is meant to serve. As the certificates are special ones, a reasonable amount of specialisation—within limits, of course—is looked for.

Commercial Certificates.—Nowhere are the results so disappointing as in the case of the special certificate denoted the Commercial Certificate. Much has been heard in the way of complaint as to the unsatisfactory character of the training received at school by boys destined for a business career. This dissatisfaction is a thoroughly healthy sign, but no real improvement can be made until merchants and business houses extend some sort of practical encouragement to boys to equip themselves properly before they enter an office. Again, it is essential that thoughtful men in daily touch with business conditions should make up their minds definitely as to the subjects which ought to find a place in the curriculum of the commercial course, and should carefully study the problems as to the most advantageous methods of teaching these subjects.

Publication of Results.—A most important step has this year been taken by the Department with regard to the publication of results. Statements of results, it is alleged, may be seriously abused. Misleading comparisons are frequently instituted between schools where the conditions are entirely dissimilar. Grave injustice may in this way be done. The Report, therefore, omits the figures for the various subjects of Leaving Certificates. This is due to the fact that there has recently been discernible a distinct tendency to make what is called the "average pass" into a fetish, and to appraise the work of individual teachers by reference to this, and to this alone. As a matter of fact, the Report says that the only figures that have any real value as a measure of the manner in which a school is fulfilling its functions are those that relate to Group Certificates.

DEATH OF MR. J. R. LANGLER.

THE first month of the New Year has been marked by the death of one of the greatest ornaments of the teaching profession. Many of our readers must have known him intimately through his connection with Westminster Training College, others have known him through the N.U.T., of which he was President in 1881, or through the Teachers' Guild, of which he was a member of the Council, and none can fail to have been impressed with his devotion to education and to those engaged in it. Mr. Langler was born at Brixham in Devonshire in 1826, so that at the time of his death he was in his eightieth year. His life's work was given to Westminster Training College, where he lectured in French and Geography, the latter being a subject of which he was particularly fond. He was a Fellow of the Royal Geographical Society, and the author of *Popular Astronomy and Mathematical Geography*, and other geographical works. He was a keen student of the art of education, and many of his students owe their professional success, especially among infants, to his guidance and advice. But however high may be our estimate of him as a teacher we think still more of him as a man. He had broad views combined with firm convictions, great tact and patience, and a depth of that "pure religion and undefiled" which led him to seek the "fatherless and widows in their affliction, and to keep himself unspotted from the world." He was in the fullest meaning of the term a Christian gentleman.

THE Board of Education have had under consideration the questions connected with the attendance at public elementary schools of children under five years of age. In view of the many difficulties which the matter presents, it has been decided to reconsider the advisability of laying before Parliament the minute which had been proposed for modifying the system of grants in respect both of children under five and of the other scholars in public elementary schools. This decision involves a reconsideration by the Board of the manner in which some measure of relief can best be afforded to those areas where the burden of the education rate is specially heavy.

OUR CLASSROOM AIDS.

COURSE OF LESSONS IN DOMESTIC SCIENCE.

SECTION II.—VENTILATION.

Step I. Preparation. 1. *The Necessity of Providing Ventilation.*—A brief recapitulation of what has already been learnt concerning respiration will show the need of taking some steps to remove the impurities that result from respiration and combustion and securing a supply of fresh air of standard purity. It would provide an interesting and useful exercise in arithmetic for the elder scholars to calculate the amount of fresh air required by an adult per hour:—

Pure air contains 4 c. ft. of CO_2 per 10,000 c. ft., and air which exceeds 6 c. ft. per 10,000 c. ft. cannot be breathed without ill effects. This allows the addition of 2 c. ft. of CO_2 to every 10,000 c. ft. without passing the limit of respiratory purity. Since an adult gives off about ·66 c. ft. of CO_2 per hour, this requires

$$10{,}000 \times \frac{\cdot 66}{2} = 3300 \text{ c. ft. of fresh air to dilute it.}$$

2. *Other Impurities in the Air.*—In addition to the gaseous impurities due to respiration and combustion, the air is also contaminated by particles of solid matter. These are the motes which we see "dancing" in the sunlight, but when examined under the microscope we see what dangers to health lurk among these dancing motes. A sample of air examined at Manchester was found to contain particles of vegetable matter, such as hay, straw, wood, etc.; fibres of cotton, wool, and flax; and, most abundant of all, minute spores or seeds of various diseases. These spores are so tiny that over 25,000,000 of them would go on a halfpenny; but their importance cannot be gauged by their size, for the result of their presence is seen, not only in the spread of disease, but also in the growth of mildew on damp articles, the fermentation of sugary liquids, etc.

Step II. Presentation. (1.) *The Purification of the Air.*—It is perfectly obvious that if Nature had no means at all of removing these impurities the air would very soon be quite unfit to support animal life at all. Happily for us, Nature has provided that the waste products of animal life shall serve to support vegetation, and *vice versâ*. The beautiful green colour of the leaves of a tree is due to a waxy substance known as chlorophyll, which, in the sunlight, is able to break up the CO_2 into its elements, retaining the carbon to build up the tissue of the tree and setting free the oxygen. Hence we see that our parks, etc., are not only safe and beautiful places to play in, but are also doing an important service to the city by breaking up the carbonic acid gas and giving us back pure oxygen in its stead.

The rain is also an important agent in cleansing the atmosphere. All city children know how black rain-water looks when caught in a tub or pail; this is, of course, owing to the soot and dirt it has washed out as it fell through the air. In addition to washing out the solid particles, the rain also dissolves CO_2 and ammonia.

Nature, then, supplies us with an inexhaustible flow of fresh air, and the only question for us to consider is how best to remove the foul air from our rooms and obtain fresh. In large buildings this is often done by mechanical means, which ensures that the supply of fresh air is regular and under proper control; but as very few dwellings are provided with any system of artificial ventilation, we will confine our attention to natural ventilation.

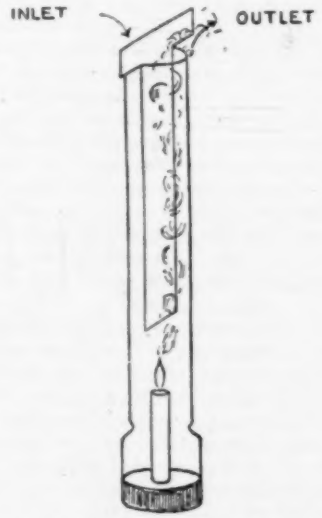
(2.) *Simple Methods of Ventilation.*—In order to obtain thorough ventilation we must have:—

(*a.*) Inlets for pure air.
(*b.*) Outlets for foul air.
(*c.*) Motive power to set the air in motion.

(*a.*) *Inlets for Pure Air.*—In most dwelling-rooms the door and the window are the only means of admitting fresh air. The former, however, generally gives on to some other part of the house, so it is important to ascertain that the air that enters that way has not already been contaminated; if the air that enters can be relied on as being pure, it will have the advantage of being slightly warmer than if it enters directly from outside. This is the chief drawback to the window as an inlet, and must be met in one of two ways: either the window must be thrown wide open during the absence of the occupants, thus ensuring a thorough flushing of the room with fresh air, or some means must be taken to direct the air upward. The former method should always be adopted for airing the bedrooms in the morning, and not only the room itself, but also the night-clothes and the bedding, which should be thoroughly opened out and exposed to the air for some

time. Schoolrooms should also be flushed out in this way during the recess, and also at dinner-time. In sitting-rooms and living-rooms it is not always convenient, or in cold weather advisable, to flush the rooms in this way, but efforts should be made to secure a steady current of air *without a draught*. The best method of utilising an ordinary sash window is either to open the bottom sash three or four inches and place a piece of board in the opening, or else to pull down the top sash and cover the opening with perforated zinc; in either case the air enters between the sashes and is directed upwards; additional air is obtained when the zinc is used, but at the same time part of the light is sacrificed. Where expense is not an object, the top sash is sometimes hinged inwards, or ventilators fixed in the window; such as Cooper's, consisting of a circular disc with oval holes, or the Louvre Ventilator, a number of parallel pieces of glass directed upward.

(*b.*) *Outlets for Foul Air.*—To show the class that the same opening will not serve for inlet and outlet, light

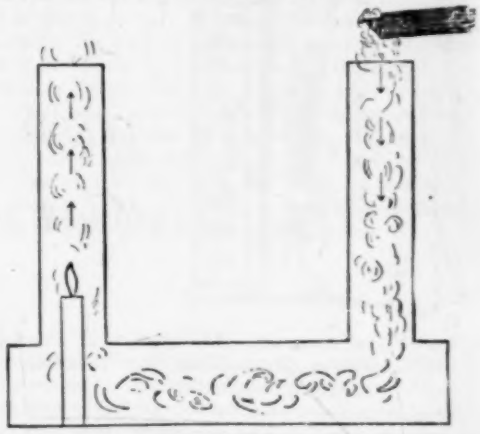


a small piece of candle and let it burn in a cylindrical lamp chimney, the bottom of which is closed with a cork, leaving the opening at the top to serve for inlet and outlet. In a short time the candle goes out, but if the experiment is repeated with a narrow strip of cardboard down the chimney to divide it into two the candle will burn steadily, for one side of the card will serve as an outlet and the other as an inlet. In a room the chimney is the natural outlet, and on this account should not be closed when there is no fire, as is so frequently the case.

(*c.*) *The Motive Power.*—Unless something causes the air to move there can be no ventilation; in artificial ventilation this motion is usually caused by mechanical means, but in natural ventilation we have to rely on diffusion and unequal pressure. When two gases are in contact with one another they will gradually mix together by a process called diffusion. This is, however, too slow a process to be reckoned on in ventilating a room which is in use—in fact, it need hardly be mentioned at all, except to explain how noxious gases from defective drains, dust-bins, &c., spread themselves through the entire house.

When air is heated it becomes less dense, and consequently lighter bulk for bulk, the result being that heated air will rise. This may be shown by means of a fire-balloon, which may be purchased at any toy-shop for a few pence.

When a fire is alight in a room, this will supply a motive force which will keep a constant current of air passing through the room provided there are sufficient inlets. A model for illustrating this point may be



made with a couple of lamp chimneys and a long narrow box; the chimneys are placed at the ends of the box, which serves to connect the two. If a candle is lit in one chimney the air will ascend that chimney and descend the other, the motions of the air being shown by holding a piece of smouldering brown paper close to the descending shaft.

The unequal temperatures on different parts of the earth give rise to similar air-motions on a large scale, which we call winds. Wind is another natural motive force for moving the air from our rooms, either by blowing through the room or by blowing across an outlet such as the chimney. If we repeat our former experiment, but, instead of lighting a candle in the chimney, blow across the top, we shall find that air is drawn down the other chimney, although not quite so violently as before. Hence we see the importance of keeping the register of the stove open, for the chimney still serves as an outlet through which the air is drawn by the wind that blows across the top.

Whatever may be the cause of the unequal pressure, it should be borne in mind that with high pressure without and low pressure within, if the inlets are small and inadequate, such as key-holes, cracks of doors or window-frames, &c., the air will be forced in with great velocity and create a draught; in this case the remedy should not be sought in sand-bags and rubber tubing, but by increasing the size of the inlets and thus decreasing the velocity.

Step III. Association. *Dangerous Occupations.*—We have so far only mentioned those impurities that are a danger to every one, but as many of the children when they leave school will engage in occupations that have their own special dangers, a few words on that subject should be given. All occupations in which a large amount of dust is created are more or less dangerous to those engaged in them: the dangers of the miner or the sailor are slight compared to those to which flax-dressers or knife-grinders are exposed, most

of whom die at an early age, of consumption, as a result of constantly inhaling the fine dust from the flax, or particles of steel and grinding-stone.

Improved ventilation of the workshops has greatly diminished the mortality in these and similar trades, but much rests with the operators themselves, who would add many years to their lives if they would remember: (1) To breathe through the nostrils, the fine hairs of which serve to exclude the dust from the lungs; (2) if there is a large amount of dust, to use a respirator made of crape or some such material.

Step IV. Formulation.—Ventilation requires inlets, outlets, and motive force.

Inlets should bring air from a pure source; they should be small and numerous rather than few and large; if insufficient they will cause a draught; the best position is about 8 feet from the floor; the current should be directed upward.

Outlets.—The chimney is the best outlet; if there are others they should be placed as near the ceiling as possible.

Motive Force may be natural or artificial; for dwelling-rooms the fire or the wind serve to supply the motive force that changes the air.

Step V. Application.—The result of these lessons should be increased attention to the ventilation both of the school and the home.

A knowledge of the respiratory organs should lead the children to take a more intelligent interest in those physical exercises which are designed to expand the chest and strengthen the abdominal muscles, thus increasing the capacity of the chest, and as a consequence improving the oxidation of the blood.

NOTES ON AN EXPERIMENTAL COURSE OF LESSONS ON PLANT LIFE AND SOIL.

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(*Continued from p.* 355.)

EXPERIMENT 9 may be modified as follows for a large class:—

Experiment 10.—Fit a test tube with a cork perforated by a tube bent at right angles; put the seed (or, better, the mixture of broken seed and soda-lime) into the test tube, and dip the end of the bent tube into a solution of red litmus, privet, or cabbage extract (see Experiment 8). Heat. The gases given off from the seed bubble through the solution, and in a short time turn it blue; the change can be readily seen in a large room.

Experiment 11.—Do the same experiment with the white of a boiled egg; ammonia is given off here also.

One of the fundamental principles of scientific method is that like effects arise from like causes. Experiment 11 shows us that egg albumin behaves in the same way when heated as the seeds examined; it may therefore be supposed that egg albumin has something in common with the seeds. Numerous experiments, unsuitable for school work, have proved the truth of this. The common substance is called "protein."

Where the children have been taught, in domestic economy or other lessons, that protein is the nitrogenous part of food, a further examination of ammonia is necessary.

Experiment 12.—Obtain a stream of ammonia gas by *very gently* warming the concentrated solution in a flask; pass the gas through a wide tube containing red-hot copper oxide, and collect the escaping gas in a jar filled with water and inverted in a trough of water. The gas obtained has the following properties:—

(1) it will not allow a taper to burn in it,

(2) it does not turn lime-water milky.

These are the properties we found the "inactive air" or nitrogen to possess (Experiment 53, Air and Water, vol. xxv., p. 460). The experiment therefore shows us that ammonia contains nitrogen, and hence that seeds and white of egg contain it.

In schools unprovided with gas or strong blast lamps, and where, consequently, the wide tube cannot be heated to redness, the copper oxide may be replaced by chromic acid, which need not be heated at all. In this case the heating of the ammonia solution must be cautiously performed, as the chromic acid becomes very hot—sometimes red hot—during the process.

Experiment 13.—Burn some seeds in an open dish, and heat for a long time. The residue is at first black, due to charcoal (Experiment 5), but on long-continued heating becomes quite white, and this residue will not burn away. It may be called "ash," and should be bottled up for future use.

Our final result, obtained by breaking up the seed by rather drastic measures, is that it is made of

carbon,
hydrogen,
oxygen,
nitrogen,
an ash to be examined later.

We shall now need to use rather gentler methods of procedure.

Experiment 14.—Make a solution of iodine in water containing some potassium iodide; this solution will be frequently wanted.

Rub some starch in water, pour a few drops into a test tube one quarter filled with water, and boil. Then cool and add a drop of iodine solution; a beautiful blue colour is produced. We shall regularly use this test for starch.

Experiment 15.—Break up some wheat in a mortar, grind hard for some time, then shake up the wheat meal with water, allow to settle for a moment, pour some of the turbid liquid into a test tube containing a little water, boil, cool, and add a drop of iodine solution. A blue colour is produced, showing that the wheat grain contains starch.

Do the same experiment with peas and beans.

Experiment 16.—Repeat Experiments 3 and 4 with starch; water and a combustible gas are given off, and charcoal is left behind. Repeat Experiment 10 with starch; no ammonia is given off.

We learn, therefore, that the seeds examined contain starch, and that starch is made of carbon, hydrogen, and oxygen (see Experiment 7), but does not contain nitrogen.

Experiment 17.—Put a little flour (not too much) into a calico bag, knead up under water for some time, and show that the turbid liquid contains starch, *i.e.* that the starch has washed out through the calico. The substance in the bag is now very sticky, and can be drawn out into threads; it is called gluten. If dried and heated it gives off quantities of ammonia.

By this simple device we have separated wheat flour into a nitrogenous part (gluten) and a non-nitrogenous part, starch. Ground peas or beans may also be used, but in these cases no gluten is produced and the separation is not so effective as before.

Germination.

Experiment 18.—Put some dry seeds in a dry saucer and leave exposed to air. In another saucer put some wet seeds, and periodically add a little water. Weigh the seeds, and measure the girth of each one with a piece of cotton. Repeat these measurements at intervals of about five days. The dry seeds undergo no change; the wet ones, on the other hand, increase in volume but decrease in weight. After a time the radicle appears, then follows the plumule, which will develop into the stem. Sketches must be made, with dates and measurements.

The botanical aspect of the subject has been so often dealt with that it is unnecessary to say anything about it here.

Experiment 19.—Moisten some seeds, put into a small bottle, cork tightly, and cover the cork with sealing wax so that air cannot enter. Put another lot of moistened seeds into a similar bottle, which, however, is not corked, but left open so that air can get in.

In the latter case germination takes place, in the former it does not.

Experiment 20.—A third bottle containing moistened seeds and not corked up is put out of doors, where the sun's rays will not reach it. In cold weather germination is considerably retarded, and, in the case of peas or maize, may be altogether inhibited.

The conditions necessary for germination are therefore

moisture,
air,
warmth.

Unless all three conditions are fulfilled, germination will not take place.

When seeds are put into the ground in a garden or in fields, they are exposed to danger from several quarters. Birds and mice may eat them, and they may be attacked by a number of smaller creatures living in the soil. It is a good rule only to sow seeds when they can at once germinate, and the state of the soil must be such that the above conditions are fulfilled.

The teacher should recall the method adopted in making a seed bed. The ground is well dug or ploughed in the autumn and left in as rough a state as possible, exposed to the winter rains and frosts. The soil thus becomes aerated and very well wetted for some little depth; the first breaks the clods and the earth becomes "mellowed down."

Just before seed time the rough ground is if necessary dug over again; it is smoothed down by a harrow or a rake; the seeds are then put in. Small seeds are simply laid on the ground; larger ones, like wheat and barley, are put a little way in; and still larger ones, peas and beans, are sown two to four inches deep. The ground is then rolled, or beaten down flat with a spade.

The seed time is arranged so that the temperature of the ground is sufficiently high for germination. Hardy seeds—wheat and beans—may be put in in cold weather; more delicate ones—turnips, maize, and many flower seeds—require a warmer bed, and are sown in late spring.

THE SCHOOL WALK AS AN INTEGRAL FACTOR IN EDUCATION.

BY EDMUND A. GREENING LAMBORN, OXFORD.

THE School Walk is rapidly becoming, under the pressure of educational opinion—or authority—an established custom; but (as in the case of manual training, which is still generally looked upon as a kind of "extra"), it is very doubtful whether it has yet come to be regarded as an essential integral part of the school scheme of work. There is a common tendency to regard it from the recreative point of view, but a more general mistake is that which associates it with a special subject only—viz., Nature Study. Hence arises the objection sometimes made to it that it upsets the time-table, giving extra time to Nature Study to the detriment of other subjects. This is a most unfortunate misconception. The school walk is not concerned with any one subject, but with the curriculum as a whole. Its great purpose is to ensure that every idea or percept in the child's mind has a concrete fact as a basis, that, so far as possible, every term he uses—river, knight, furlong, area, arable, cultivate, drain, moulding, hundred, thousand, etc., etc.—shall answer to a mental image which is the result of his own experience and not of a constructive effort of his imagination. (Note that mental images are the bases of ideas of verbs, adjectives, adverbs, etc., as well as of those of nouns—we *see* doings as well as things.) Now this purpose is obviously of equal importance in all subjects. It is as vital to complete comprehension that the child should have *seen* a mile, an acre, or a ton before dealing with them in the arithmetic lesson, as it is that he should have seen a poplar, a brook, or a woodpecker before discussing them in the geography or Nature lessons. If this is realised the time-table difficulty vanishes. The only interference with the time-table will be that its water-tight compartments will be temporarily dispensed with. A few minutes' attention to a geographical fact—as of the term "plain" illustrated by a field or fields—will be followed perhaps by an arithmetical question as to the estimated areas of these fields, and rough calculations of their rents, or of the weight of crop which might be expected from them at so much per acre. So the various school subjects would alternate, but none would claim a monopoly of the time available if—and on this everything depends—the details of the walk had been carefully prepared and planned beforehand. The great danger of these walks, which turns many of them into mere aimless recreative excursions, is the lack of preparation.

School walks have for some years formed an integral factor in the scheme of work of the writer's school. A half-day excursion is made by each class each month, and whole-day excursions are made terminally (three terms to the year). It is proposed to describe the preparation and conduct of one of these day excursions recently made by the writer and a class of fourteen older scholars as exemplifying what has been previously written.

Preparation. *A. By the Teacher.*—Having selected a suitable route, a "County History" was consulted for the purpose of noting any facts concerning the district to be traversed, with which the teacher might not have become acquainted. A preliminary walk over the route was then taken by the teacher, and notes

made from which the following outline scheme was drawn up:—

ROUTE.

1. 10 A.M. Bus to Iffley—Iffley Church.
2. Field-path to Littlemore, thence to Sandford.
3. Field-paths and Roman road to Garsington.
4. Bridle-road along Garsington Ridge to Horspath.
5. Return along disused London Road on Shotover upland; tram from St. Clements.

OBJECTS.

I. Historical—
   1. Norman church at Iffley.
   2. The church of the Knights Templars at Sandford.
   3. The Roman Way from Dorchester to Alchester.
   4. The Transitional (Norman Early English) church at Garsington, illustrating the period of blending Norman and Saxon races.
   5. The Early English church at Horspath.

II. Geographical—
   1. Land-slope and drainage—illustrated by Garsington Ridge and Northfield Brook.
   2. The position of Oxford—seen from Garsington and Shotover Hill.
   3. Village industries.

III. Nature Study.—Autumn Phenomena—
   1. Seeds and seed distribution.
   2. Leaves and leaf-mould.
   3. Wind and its uses.
   4. Earth-worms.

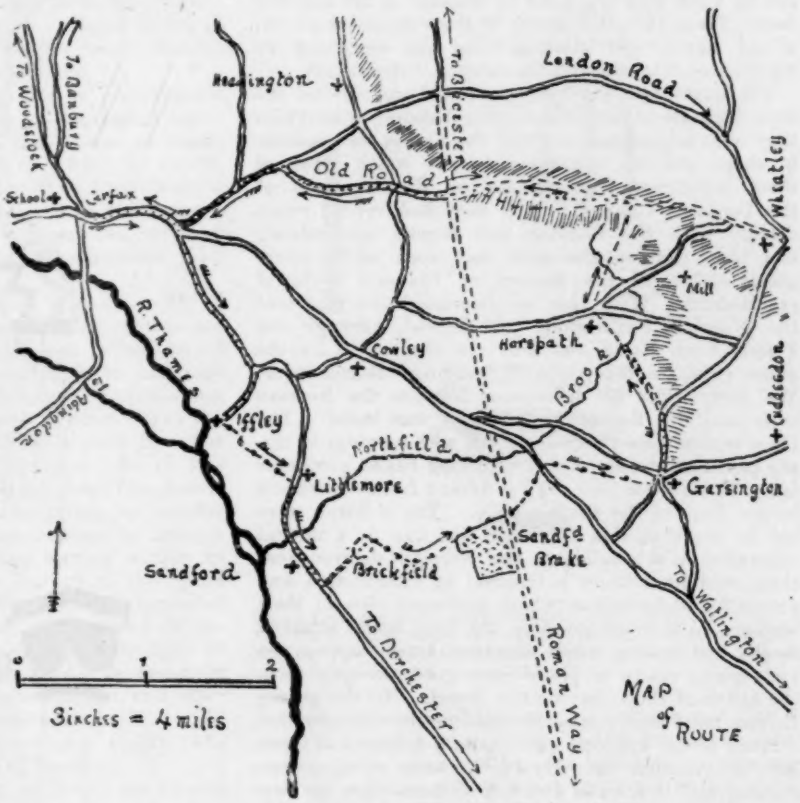
IV. Arithmetic—
   1. Rough measurement and visualisation of an acre.
   2. Practice in judging areas.
   3. Rough calculations of rents.
   4. Cubic contents of ricks.
   5. Calculations of heights of trees by measurement of shadows.

V. Poetry—
   1. Autumn poems (Shelley, William Allingham).
   2. *The Homes of England* (Hemans).
   3. *The Yew* (Tennyson).
   4. Gray's *Elegy*.

VI. Composition—
   1. Oral—conversation *en route*.
   2. A written account at school subsequently from brief notes taken at stopping places.

VII. Drawing—
   1. Rough sketches of arches, window-tracery, etc., to be subsequently reproduced in detail in drawing lessons at school.
   2. Memory Drawing.—A lesson will be devoted to memory drawing of objects illustrative of the walk.

VIII. Physical Exercises.—Needless to say such a walk itself is much more beneficial than formal playground exercises could be, but it was borne in mind that special attention should be paid—
   1. To correct breathing, especially on the hills.
   2. To the eye-range of the children.—The eye of the town dweller is constantly fixed on "near" objects, and so the change of focus is small. But the eye requires *vista* as an essential of its welfare, hence the superiority of seamen's eyesight. Therefore in school walks the special opportunity offered should be taken advantage of to the full, and the children should be encouraged to change the focus frequently by fixing their eyes on distant objects.



Preparation. *B. By the Class.*—(1.) The teacher's scheme had been drawn up in view of the fact that the syllabuses of work for the term were concerned with: The Surface of Europe, "Saxon, Norman, and Dane are We," Square and Cubic Measures, Nature Study in Autumn, etc. (There is of course no need to reproduce the syllabuses here, but it should be remembered that this was the *ultimate* preparation made by the class.)

(2.) The *immediate* preparations were made in the geography lesson preceding the excursion, when each boy traced out the route on an Ordnance map, and made a copy of the particular district to a larger scale. A short address was given by the teacher, dealing with the points to which observation was to be specially directed on the morrow.

The Walk.—At 10 A.M., each boy being provided with a "Picture-Postcard" copy of the Ordnance map, his own sketch-map, a note-book and pencil, his bus fares (saved up in anticipation), and last, but not least, his lunch-packet, the top of a bus was monopolised, and the expedition commenced. From the bus-top the direction and strength of the wind were noted and the state of the sky. Various boys were called upon to name important buildings passed *en route*, to give the cardinal points in relation to the various streets, and to indicate on their maps corners and points passed. The payment of fares to the conductor suggested a question or two in mental arithmetic, including an

estimate of the average daily earnings of the bus, in reference to which the conductor was finally appealed to for expert corroboration or correction.

Arrived at Iffley we proceeded to the village church —a famous specimen of Norman architecture dating from 1160 A.D. The reasons for the choice of site, on the high firm ground overlooking the Thames and the village, were elicited, and also the fact that churches are so built that the altar or chancel is towards the east. From this, the points of the compass were obtained again, and starting from the west end we commenced a tour round the outside of the church.

The doors and windows are round-arched, and the boys were asked to name another building with which they were acquainted in which the arches were similar in shape and set in similar massive walls. Most of them mentioned the Camera or Reading-room of the Bodleian Library (which they had visited when dealing with the Romans and Roman civilisation), and they recalled the fact that such arches were characteristic of the Roman or Classical style of architecture. With this we associated the fact that the Norman civilisation was derived, through the Franks, from Rome, and thus saw the reason for the name given to this style of building—Romanesque. We now looked for differences between the Norman style and the Roman on which it was based. The Iffley arches were richly decorated with carvings in zig-zag patterns, strange heads with long beaks, grotesque faces, flowers, etc., all very different from the severe formal lines of the Classic style. The children were led to see that this difference was due to a mental difference in the builders—the Normans derived from their wild forefathers a freedom of imagination and antipathy to formalism which is clearly seen in their works. To their imagination, the long beaks attached to the evil-looking heads aforementioned, represented evil spirits ready to pluck away good thoughts from the hearts of those leaving the church. To the graver Roman mind such a conceit would not have occurred.

Some of the windows were entirely different in form, but examination showed the Norman string-course, curving still in a *round* arch above them, showing they were later insertions in the original Norman wall. We noted their shapes, but postponed discussion of the style (Perpendicular) until we reached a church in which that style was more fully illustrated. Having surveyed the church thoroughly from the outside we passed in and observed the identity of the interior carving on the chancel arch, etc., with that on the outside. We noted especially the massive pillars supporting the roof, standing on square plinths as in the classic style. The "cushion capital," another mark of the Norman style, was noted also, and rough sketches made of it and of the window mouldings.

We then passed out into the churchyard again, and inspected the great yew tree which is probably contemporary with the church itself. The teacher quoted some stanzas from *In Memoriam*, beginning—

> "Old yew that graspest at the stones
> That name the underlying dead,
> Thy fibres net the dreamless head,
> Thy roots are wrapt about the bones."

And also some verses from Gray's *Elegy in a Country Churchyard*, including—

> "Beneath those rugged elms, that yew tree's shade,
> Where heaves the turf in many a mouldering heap,
> Each in his narrow cell for ever laid,
> The rude forefathers of the hamlet sleep."

(These poems formed the subject of subsequent poetry lessons at school.)

A question was put as to the reason for the presence of yew-trees in churchyards, and one boy knew it, viz. that our forefathers believed the yew had power to keep away evil spirits who might trouble the dead—a further evidence of untrained imaginative powers.

A.—Geometrical basis of Romanesque Arch characteristic of Anglo-Norman architecture.
B.—Interlacing round arches, showing how the pointed arch may have been suggested. (The more probable explanation is that it was evolved in the necessity for vaulting over spaces of oblong form.)
C.—A Norman Arch, showing zig-zag or chevron moulding, bead ornament, and cushion capital. 1120 A.D.
D.—The cushion capital, characteristic of Norman architecture. 1080–1180 A.D.
E.—The Beak-head ornament, frequently used in richly-worked Norman doorways, as at Iffley. 1160 A.D.
F.—Billet-moulding, a common Norman ornament over doorways. Both square and round billets are used.

The vicar of Iffley, who had been an interested spectator from the vicarage windows, came out and supplemented the information we had thus far gathered—but having given the chief points of our stay at Iffley, I will pass on to the field-path leading to our next village of Littlemore.

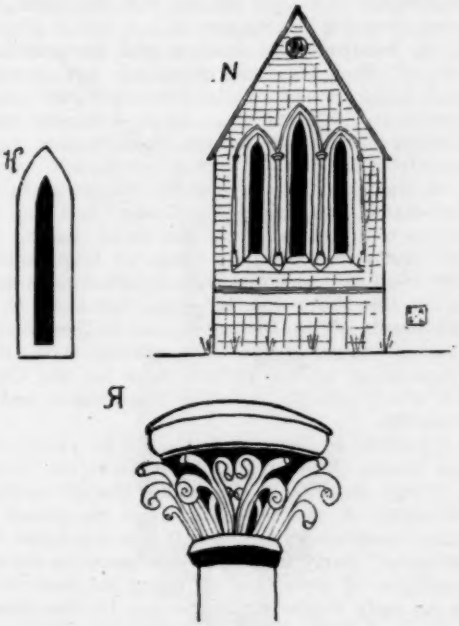
In the fields we measured an acre with a string marked in poles which we had brought with us, and having "visualised" it, the boys estimated the areas of neighbouring fields. Again we sought and found expert confirmation in the person of an interested shepherd, from whom we also gathered much information as to rents, crops, stock, etc., which would be too lengthy to set down here. Yet it is of great importance to dwell on the desirability of seeking whenever possible on these occasions the special practical knowledge, which by tact and a few judicious questions may be gained from such sources as these.

We rested under the lych-gate of Littlemore church, and the boys were told of its first vicar—afterwards Cardinal Newman—the author of *Lead, Kindly Light*, a verse of which was sung by one of them. The church is built in the Early English style (though not, of course, of that period), and we endeavoured to realise the correspondence between the style of building and the character of the builders who originated it.

The Gothic style is the expression in architecture of the nature of the great Teutonic race from which our Saxon and Norman forefathers sprang. Children of the woods and fields, they long objected to buildings of stone, and when at last the influence of civilisation made them builders they impressed on their works the spirit of their native woods, and built their churches after the type of their forest temples. So in this Gothic church we saw how, abandoning the classic models, they replaced the massive pillars by slender grouped columns like twin trunks springing from a common root to branch aloft like waving boughs in the high vaulting of the roof. Instead of the round arches were narrow leaf-formed openings, decorated with natural foliage instead of conventional forms. The subdued light came softly down as sunlight in the woods, and the whole effect was of a forest in stone. Something of this the boys realised, and after sketching some lancet windows and "stiff-leaved foliage" characteristic of the style (temp. Henry III.) we passed on to the next village of Sandford.

At the bottom of the little hill on which the church was built we stopped to notice the village brook—marked Northfield brook on the Ordnance map. From the hill-top we were able to trace the line of willows that marked its course, winding away to our right from the distant hill of Shotover, where we were presently to find its source, and on our left widening in the low meadows, and eventually reaching the Thames near Sandford Lock, which we could see below us. We noted the land, sloping from both sides to the brook in the middle, and saw how the roadside ditches ran into it. We then turned our attention to the fields between us and the river in the "valley" of the brook. It was observed that all the low-lying ones near the water were grass fields, and a reason for this fact was sought. It was suggested that the moisture in the low land, while making grass grow long and lush, would make ploughing difficult, and besides there would be danger to grain crops from floods. Again, on the distant hills the same appearance of greenness was seen, and we supposed that the difficulties of agriculture on hill slopes made them more often "laid down" in grass; so we inferred that in hilly or marshy districts the industry will be mainly pastoral. But again, later in the day, it was noted that many fields apparently suitable for arable land were pastures, and so we halted for a moment to discuss the pros and cons of Corn Laws and "land gone out of cultivation."

Sandford church presented a "new" appearance, but a closer inspection showed two round-arched windows in the new walls of the chancel. These were recognised as like the Norman arches of Iffley, but plainer,



K.—A Lancet window, Early English style. 1200 A.D.
N.—Three Lancet windows in the east end of Littlemore Church.
R.—An Early English bell-shaped capital, with the stiff-stalked foliage characteristic of the style.

more like the original Roman type. There was then a very old church here originally, and its stones had been used to help make the present building. Inside we saw the old font with a great red cross on its white stone. The boys recognised it at once as "the red cross on the white mantle" of the crusaders. In the farmyard close by were the ruins of the Hospital of the Knights Templars, and this little village church had bonds of union with the Temple at Jerusalem, for here the Templars lived and worshipped in the neighbourhood, land having been given them by the wife of King Stephen.

Our way now led across a brickfield, and we stopped to notice the stratification of the soil visible in the pits from which the clay had been dug. One of the workmen explained the various stages in the making of a brick, but as time was fleeting we could not linger to see them exemplified. We crossed a great plain, and, by observing how the wind swept across the level expanse, we got some ideas of the climate of the great plain of middle Russia, and of the protection which was afforded to Lombardy by the sheltering Alps.

Here also we measured the height of a tree by erecting beside it a willow stick ten feet long. With our measuring line we found the length of the two shadows, and so worked out the sum: "If a height of 10 feet throws a shadow of 8 feet, what is the height which throws a shadow of 53 feet? Ans. 66¼ feet." We now came to the Roman Road which runs between

Dorchester and Alchester (Bicester). We had previously visited a section of this, so most of the boys were able to point out how the Roman character was illustrated by this piece of their work. (See *Practical Teacher*, June 1904.) We crossed a highway, which the boys were made to identify by taking its bearings and consulting their maps, and then climbed the hill to Garsington. On the hill-top we had lunch, and "the conversation became general."

As an interlude the teacher read Mrs. Hemans' *Homes of England*, illustrating by the "cottage homes" below us and by the "stately home" of the Harcourts at Nuneham, standing on a wooded height overlooking the Thames, which could be seen in the distance from our point of vantage on the hill. Lunch over, we challenged the boys of the village school to a football match, "ten minutes each way," and then they passed on to afternoon school and we to church. The church exemplifies well the three to four centuries —1200–1600—in which Gothic architecture took its origin in the Early English style, developed to the mature beauty of the Decorated, and declined through the various stages of the Perpendicular style, till it was superseded by the revived taste for the Classic models which came in with the Renaissance and the Reformation.

This growth, decline, and fall could be plainly read on the stones of Garsington Church—as on those of most village churches in England. On the shafts of the windows of the tower the boys recognised the Norman "cushion-capital," but it was decorated with "stiff-leaved" Early English foliage, showing evidence of transition of style, and so fixing the date of the tower as early thirteenth century. In the chancel were signs of Early English windows, visible in the characteristic "dog-tooth" ornament, but they had been widened, and their upper lights filled with tracery in geometrical patterns in the style appropriately named the "Decorated." As our own parish church is of that period the boys recognised the style at once. They were greatly interested in the "low-side" or "lepers'" windows, on the outside of which in the Middle Ages lepers and other plague-infected persons had been wont to worship and view the Elevation of the Host before the Altar. These windows are nearly all of the period following the return from the Holy Land of the Crusaders, who brought in their train leprosy and other eastern diseases. The aisle windows illustrated the Perpendicular Style, in which the windows and doors became wider, and so the arches more obtuse and depressed, till at last the walls became huge windows divided by many vertical mullions and horizontal transoms, almost, at last, as severe and formal as the square panes of to-day.

In the green lanes between Garsington and Horspath we collected various kinds of seeds, and noted the manner of their distribution. Those high up on the tall trees, where the wind could reach them, had "wings" or samaras, which would revolve like aeroplanes as the wind caught them, and fly to find a place to germinate. Others had feathery plumules which could lift them over the surrounding obstacles, and others again, growing deep in undergrowth where the wind could not reach them, had developed hooks by which they clung to passing animals, and so got themselves distributed. Some plants distributed their seeds themselves by the sudden splitting of their capsules, and some, as the willow herb growing in the moist soil where competition was keenest, actually combined two methods by possessing a splitting pod and downy floating seeds.

In the hedges the success of those seeds whose bright seed-cases were designed to attract the birds was obvious, for thrushes, starlings, field-fares, and many other birds flew away in flocks at our approach, carrying in their crops the seeds that would later be dropped to germinate far from the shadow of the parent tree. We noticed especially the berries of the Spindle Trees, which actually used two colours—and those the brightest in the spectrum, red and orange—to attract the birds to do them service.

G.—Geometrical form of a late "Early English" window, showing "plate-tracery," *i.e.* a pattern cut through the flat stone. 1230 A.D.

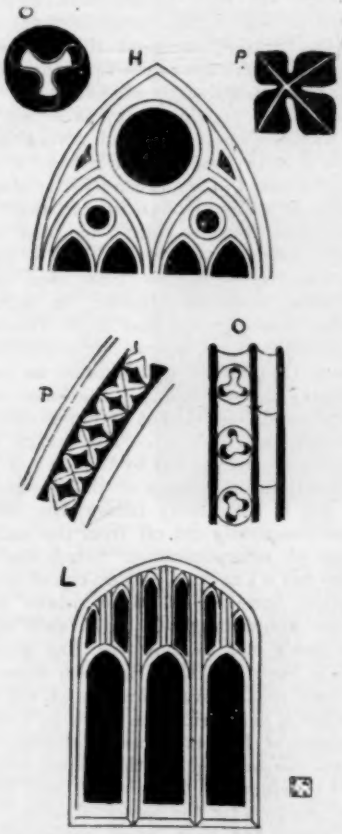
J.—A depressed four-centred arch, characteristic of late Perpendicular style, and usually indicating debased Gothic. 1500 A.D.

M.—A low-side lepers' window in the chancel, Garsington. 1350. The window has been lengthened nearly to the ground to permit lepers and others to see into the church and observe the sacred rites celebrated at the altar.

Specimens of all these seeds were obtained, briefly commented on as we went along, and consigned to our collecting boxes for detailed examination at school. We noticed also the beneficial effect of the wind—the equinoctial gales—in shaking from the trees the now useless leaves, and scattering them, as well as the seeds, so that the fertilising elements of their decomposition might be evenly distributed over the land. Then a closer search revealed here and there on the turf the stems of dead leaves sticking from holes where they had been dragged by the worms, through whose bodies they would pass to emerge as soil to feed the generations of their successors. This subject formed the occasion for a little lecture on "Cycles in Nature" and the "Indestructibility of Matter." We read here William Allingham's poem on *Autumn*, in which the trees are compared to "Indian princes," who soon "will turn to ghosts,"—

the reader will find it in Stead's *Poems for the Schoolroom* — and then we passed on down the hill again to the village of Horspath, nestling under the lee of Shotover Hill.

The church at Horspath, which we next reached, also illustrated the development of the Gothic style, but especially its early stages or "Early English." We climbed the high hill of Shotover, and rested on the summit, looking down on the village it sheltered from the east winds, and on the spires of Oxford



O.—The Ball-Flower ornament—a characteristic ornament in the Decorated style. 14th century.

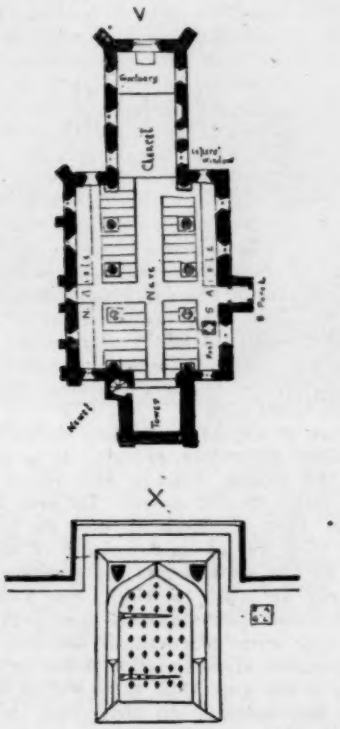
P.—The Dog-tooth ornament, characteristic of Early English work. Usually placed as an enrichment in a hollow moulding.

H.—Geometrical basis of a "Decorated" window, showing the evolution of "bar-tracery," *i.e.* patterns composed of bars of stone-mullions and transoms. 1280–1380 A.D.

L.—Geometrical basis of a "Perpendicular" window, showing the characteristic four-centred arch mullions running right up to the head of the window, and transoms dividing the lights horizontally.

City, lying low in its cup in the hills. The maps were laid flat on the ground, turned to the correct points of the compass, and verified from observation of the surrounding country. Then we tracked out the spot where Northfield brook seemed to lose itself in the hill, and soon found the tiny spring in which it had its origin. The homeward march then commenced, and a couple of miles along the old road by which Queen Elizabeth, Shakspeare, and many another of England's great have visited Oxford, brought us into St. Clements, where the new London Road branches off, and so by a welcome tram to a still more welcome tea.

We are now engaged at school in "formulating" the knowledge gained as the result of our school walk. The rough calculations mentally made, of areas, rents, etc., are being verified in arithmetical exercises, in which knowledge of prices, etc., is put to use. If a boy were set such a question, for instance, as "what is the rent of a farm of 345 acres @ £114, 10s. 6d. per acre?" he would work the sum, but add a footnote to the effect that the average rent of farm land is only £2 per acre. The poems read on the journey have



V.—Plan of Garsington Church—"a good example of the original plan of a parish church unaltered." The most usual plan of an English mediæval church is—

1. A Chancel without aisles.
2. A Nave with aisles.
3. A western Tower.
4. A south Porch.

X.—The South Door of Sandford Church—late Perpendicular style, with depressed four-centred arch within a square frame, a label over and shields in the spandrels.

been discussed in detail, a general account of the walk has been written, and special points of it will be the subjects of succeeding composition lessons. So in the Nature study lessons we are using the specimens we brought home, and in the History lessons reference is continually made to the illustrations seen in the works of the men whose lives and characters are the subjects of the lessons.

Thus we endeavour to make the School Walk the core, as it were, of the school curriculum.

SAKHALIN, THE ISLAND OF DESPAIR.

LORD BEACONSFIELD'S dictum that our little wars at least taught us geography may in these days of ubiquitous war correspondents, ocean cables, and wireless telegraphy be extended to the conflicts of the whole world. Nevertheless, it is to be feared that the most diligent newspaper reader has only the vaguest ideas regarding the island of Sakhalin, which has loomed large in the public eye since the publication of the terms of peace between Russia and Japan. Nor need we be surprised, for much of the island is still unexplored, and scientific travellers in the "Uttermost East" have been few and far between. Until late in the nineteenth century, the island was considered a peninsula; its insular character was only determined in 1846 by Captain Nevelsky, who, searching for a suitable naval base on the east Siberian coast, was enabled to report as follows to his patron, Count Muraviev: "God has assisted us . . . the main question is happily solved . . . Saghalien is an island, and sea-going ships can penetrate into the estuary of the Amur, both from the north and south. An ancient error has been dissipated; I now report to you that the truth has been discovered." That the island was once a peninsula of the mainland admits of no doubt. The Gilyaks have a tradition to that effect, and both polar and sub-tropical flora and fauna are to be found. Between Pogobi on the eastern shore of the island, and Cape Lazaref on the mainland, the channel is barely five miles wide.

A glance at any ordinary map shows the position of the island accurately enough. It is just about as long as the British Islands, and varies in breadth from 17 miles to 100 miles. Its area is somewhat less than that of Scotland, and its population in January 1898 was about one-eighth of that of Edinburgh. To the south across the perilous La Pérouse Strait, only 28 miles in width, lies Yezo, the most northerly island of the Japanese Archipelago.

Even this brief geographical account would have been impossible of compilation down to a few years ago. Up to the year 1903 there was no authoritative book on the island. In that year, however, Mr. Charles H. Hawes published his remarkably interesting volume, *In the Uttermost East*,[1] and gave to the world a series of acute and careful investigations into the condition of the natives and the convicts on the island. Most of the information given in this article is obtained from Mr. Hawes's fascinating pages, to which we recommend the reader anxious for a fuller account.

Mr. Hawes tells us that the country is mountainous, with the usual insular feature, a longitudinal ridge, nearer the west coast than the east. From this backbone three spurs shoot off to the east coast, the longest reaching it at about the 150th parallel of N. latitude, the other two in the extreme south. With an average altitude of 2500 feet, the range culminates in Incharapal at a height of 4860 feet. There are two main rivers, the Poronai and the Tim—the latter of which Mr. Hawes descended to its outlet on the north-east coast—and numberless torrential streams. The rivers are the highways: in summer they are traversed by native dug-outs; in the winter dog-sledges speed over their frozen surface.

Most of the country is covered with dense primeval forest, larch and birch predominating in the north, and spruce and fir in the south. The undergrowth is very thick, and berry-bearing bushes are very plentiful. The forested country is the *taiga* or Siberian jungle; the remainder is the *tundra*, a swampy, treeless country almost impassable in summer. Though human beings are rare, animals are many, the big brown bear (*Ursus arctos*) being lord of the forest, and a deity, to boot, amongst the natives. Other fur-bearing animals, such as the fox and sable, abound, while fish are extraordinarily abundant.

Sakhalin in the popular fancy is a frigid inferno, but Mr. Hawes dispels this and a number of other myths. It is true that Alexandrovsk, which stands on the west coast and on precisely the same parallel of latitude as Brighton, has an annual mean temperature just below freezing-point; but, *per contra*, its summer maximum (July) is 81° F., a temperature which is considerably higher than that experienced in the extreme north of Siberia. In fact, Sakhalin has a summer heat equal to that of St. Petersburg and London. Winter is, of course, long and severe. It begins about October 26, and lasts on an average for one hundred and seventy days; the snow varies from one to three feet in depth, but is much deeper in the tundra valleys of the rivers. The Straits of Tartary are, of course, frozen up, but by the end of December the ice is ready for the *narta* or dog-sledges to cross. Until the sea is sufficiently frozen, the island is for some weeks completely cut off from the mainland, the only means of communication being the telegraph cable, which has a knack of getting out of order.

The winter, however, is by no means so terribly dreary as one would imagine. Mr. Hawes says:—

"The winter's cold is, however, fine and dry, and though it has been said that Sakhalin does not know the calm days that prevail throughout the winter in Eastern Siberia, yet during the latter half of January and the month of February beautiful bright windless days succeed one another on the island, and the dog-sledges and reindeer are brought out, and the natives make their journeys for the barter of skins.

"The climate has been much maligned, and the notion of a land of fog and snow still holds the popular imagination. For such ideas we are largely indebted to navigators. The truth is that there is a great deal of fog at sea; but the mariners were not aware that it generally remains—like themselves, at sea—leaving a margin of about four miles from the land clear. . . . There is less annual cloudiness, in other words, more sunshine recorded on the island than in England, and the rainfall also averages less, being about 22½ inches. . . . At the time when the break-up of the weather is expected—that is, in September and early October—I enjoyed brilliantly sunny days on Sakhalin, such as one seldom gets in England. During the whole of the fifty days I spent on the island I never saw a fog, but on several occasions the coast-line of the mainland, sixty miles distant, was visible."

But little is known of the geological structure of the island. Traces of geologically recent volcanic action have been diligently sought for, but not successfully. The cliffs appear to show conglomerate resting on a hard argillaceous sandstone, and occasionally calcareous

[1] *In the Uttermost East*, by C. H. Hawes. Harper and Brothers, London and New York.

schist. There are evidences that the island is still emerging from the sea.

Apart from the Russian convicts, settlers, soldiers, and prison officials, five different peoples inhabit the land—the Ainus, of whom there are about 1500; Gilyaks, numbering some 2000; together with some 750 Orotchons, and a negligible number of Tungus. The Ainus are probably the aborigines. Living amongst Mongols, whose hairlessness is proverbial, and possessing abundant hair and ample beards, popular pictures usually represent them as exaggerated advertisements of somebody's hair restorer. Their origin is difficult of conjecture; they may be descended from the dwarf tribes of which Kamchatkan legends tell, and belong to the chain of pigmy races which stretches from Africa to Bering Straits through the Andaman Islands, the Malay Peninsula, Formosa, Yezo, Sakhalin, and Kamchatka.

Mr. Hawes paid particular attention to the dominant Gilyaks, who, unlike the Ainus, have scarcely any hair on their faces. When intermarriage has taken place, the progeny, however, have bushy beards and copious heads of hair. It is plausibly conjectured that the Gilyaks are a semi-Mongol race. They are scarcely touched by civilisation; they are simply hunters and fishermen. Their primitive beliefs still flourish, the medicine-man or *cham* is still a power amongst them, they have no written language, and they practise polygamy when they can afford it, and they are fearfully superstitious. Perhaps the most characteristic of their religious observances is connected with the rearing and slaughter of the bear, which is regarded as a representative and messenger of *Pal ni vookh*, the great lord of the mountains, who must be propitiated on all occasions, and whose terrible wrath must be averted by punctilious offerings whenever a capture is made. No animal is so greatly prized as the bear. He is caught young, kept in captivity for several years, well fed, occasionally taken out for a "constitutional," and in due time, amidst feasting and rejoicing, is led forth to be ceremonially slain. The significance of the bear fête forms a difficult chapter in comparative folklore, and the reader who is interested in the puzzle of "killing the god" may be directed to Mr. Fraser's epoch-making book, *The Golden Bough*.

The bear fête probably originated as a purely religious festival. "It has," says Mr. Hawes, "become a 'bank holiday' in the Gilyak calendar, the great break in the monotony of the long winter." Before the feast a rehearsal is held. The bear is secured with thongs and grass ropes; he is then muzzled, taken a short walk, and put back in the cage. Next day the operation is repeated, and the animal is led to the hut of his owner, and paraded around it several times. Each time the bear passes the door, his master pokes him with a twig adorned with shavings. Meanwhile three or four young women provide accompanying "music" by beating with sticks on a supported log, and an old lady performs a characteristic dance. Then comes the day of execution. The animal is tied up in the open, fed on such delicacies as rice, whortleberries, etc., till he can eat no more. "This is a characteristic trait of their attitude towards Bruin. They were about to kill him, yet they fêted him. It was an attitude of apology.

THE GREAT ANNUAL BEAR FEAST OF THE AINUS OF JAPAN.

They realised that their conduct must appear ambiguous to him, and therefore, though he had to die at their hands, yet they would do all that they could to retain his good will." On the way to the execution ground blunt arrows are shot at the animal, but not with any intention of killing or even of injuring him. Then the *cham*, amidst deep silence, goes up to the bear, and whispers in his ear—

"You have eaten many berries,
You have caught many fish,
You have frightened many people;
Your ancestors and your comrades have 'broken' many Gilyaks;
Therefore you must die for it.
But your host has fed you three whole years, not stinting the delicious dried fish.
He has given you the best water.
He has taken you for walks.
He has bathed you thrice a day in the 'summer year,'
And three 'winter years' you have lived in a nice warm lodging.
He, your host, will not kill you.
Therefore you must not complain about him to the great lord of the mountains."

This adjuration completed, the *cham* moves a little to one side, and an archer at a distance of two or three yards discharges an iron-tipped arrow at the bear. If the first shaft is not sufficient to kill the creature, another is discharged until the poor beast sinks down and dies. His carcass is dragged round the execution ground three times, the *cham* cuts out the heart, divides it into pieces, and presents them to the most honoured persons present, who are supposed in eating these dainties to imbibe some of the bear's courage and cunning. Then follow general feasting, sports, and so

forth. Mr. Hawes explains the great deference paid to the bear as follows:—

"Probably the fact of the bear being the most difficult and dangerous animal to capture adds to the value of the offering, of which the bear's spirit would be a witness. There is another consideration which lurks behind this ceremony. Not only is the bear the most dangerous animal to capture, although now the custom has deteriorated to the seizure of cubs and the rearing of them, but he is also the strongest rival of the Gilyaks. He lives, as they do, on the fish of the river, the berries of the forest; he even robs the Gilyaks' snares of the small animals caught therein. Therefore, on every count, he must die. It is useless to ask the Gilyaks of to-day the *raison d'être* of the custom, for they do not know; and in any case they would not reveal to a stranger the hidden meaning of their rites."

Now let us pass on to the wretched prisoners who are incarcerated on the island. Mr. Hawes paints a lurid picture. The convicts deported to Sakhalin are usually criminals of the worst type. As is well known, there is no capital punishment in Russia, except for regicide, and it is the fate of most condemned murderers to be sent to the uttermost East. Mr. Hawes saw a photograph of one man with nineteen murders to his account. The prison staff is undermanned, and their wretched stipends, their isolation, their debasing surroundings, the terrible monotony, and their distance from official control and salutary public opinion probably account for their general degradation, which Mr. Hawes noticed even amongst the children. He tells us that on one occasion the judicial authorities of Irkutsk were sent to Sakhalin to try almost all the prison staff for the very crimes of which their prisoners stood condemned. There are, of course, exceptions, but one of them, Patrin, chief of the Alexandrovsk prison, is depicted as a perfect monster of cruelty and depravity.

Convicts constantly escape, and create a reign of terror in the land. Murders are everyday occurrences, and no one walks abroad without a loaded revolver ready at hand. The possession of a few roubles is quite sufficient to mark a man down for slaughter by the *brodyagi* (escaped convicts). Few, if any, of these wretched men ever escape from the island, and there is a regular organisation of trackers for recapturing them. The story of Barratasvili, the "Robin Hood" of Sakhalin, is characteristic. He was sent to Sakhalin for forgery, and during his three and a half years' imprisonment he earned a good character, and was let out of jail as a "free command"—that is, a convict who has gone through the "testing" and "reformatory" jails, and is now allowed to live outside the prison on condition he does his hard labour duty—such as dragging one hundred and twenty logs a year into Alexandrovsk—as a "free command." Barratasvili became a servant in a family, and for a time his conduct was most satisfactory. Suddenly, however, he escaped, and fled to the mainland, but was arrested and brought back again. He managed to give his guard the slip, and took to the forest, where, hard pressed for food, he murdered a merchant and possessed himself of money. "Then gathering around him three or four companions, he and his band struck terror into many a heart. Yet their deeds were aimed against the rich, and he showed himself always willing to aid the poor, who, in their turn, helped him." Other murders followed, but Barratasvili eluded all attempts to capture him, though several times he escaped by a hair's-breadth. After several other daring robberies, a large body of soldiers was sent in pursuit, and in the winter-time, when overcome by fatigue, and sleeping in the forest, he was trapped. A fight ensued: Barratasvili was wounded in the shoulder, and finally shot in the forehead. Three of his companions were hanged—an event of great rarity in the Russian Empire.

For a general account of prison life in the island, we cannot do better than quote Mr. Hawes:—

"Criminals on their arrival are classified according to their sentence. Those with a sentence of twelve years and upwards are put into the worst jail, the 'testing' prison. They are mostly murderers, and if they have proved themselves recalcitrant, their chains are not struck off after the journey, but they are confined to that portion of the testing prison known as the *Kandalnaya turma* (chained prison).

"The 'reformatory' prison contains those with a term of four to twelve years, while those with less than four years are treated, after a short sojourn, as 'free commands.' The latter division includes *brodyagi* from Russia, who are sentenced to one and a half years', and the same class from Siberia, who get four years', hard labour.

"Promotion is from the 'testing' to the 'reformatory' jail, and from there to the 'free command' division, the length of time spent in each depending on the behaviour of the prisoner. Under the most favourable conditions, a man may pass only four years in the 'testing' prison, whereas another may be confined for eight, or even more. As a whole, one may say that a third of the term is spent in each section. . . . The arrival of the free-born wife of a convict will gain even a murderer release from prison, and he may forthwith live as a 'free command,' but, of course, having his full term of hard labour to fulfil. On the part of the female criminal a similar alleviation comes from marriage, or rather her choice by an exile. This will free her from the prison walls, and she may live with her 'man' on condition that her hard labour duty is done.

"On the other hand, many incur additional sentences by escape, theft, and deeds of violence. A prisoner who escapes and is recaptured not only receives a flogging with the 'plet'—which, by the way, is a murderous weapon in the hands of an executioner who is not bribed—but may get an addition of anything from a quarter to the whole of his original sentence. In the year 1900, the prisoners on Sakhalin sentenced to hard labour for life numbered 510, of whom 70 were women; but there were those who, Irish as it may seem, had more than a life sentence. These were already well advanced in life, and had yet to undergo a term of between forty and fifty years. There were 13 such, while 51, of whom one was a woman, had sentences between thirty and forty years, and 240 had between twenty and thirty years to their credit.

"The expiration of a sentence does not bring with it the long-hoped-for farewell to Sakhalin, for the ex-convict only regains his rights by degrees. For six years more he must remain on the island as an 'exile-settler'; and then, if he is in a position—*which few are*—to get away, he may go as a 'peasant' to the mainland of Siberia for another six years. Then only is he at liberty to return to Russia."

Have we not truly described Sakhalin as "the island of despair"?

A word of history, and we have done. The Russian connection with the island only dates from 1852, when it was annexed in order to guard the entrance to the Amur, on which the Russian flag was planted in the previous year. Six years later, forty convicts were at work in the coal mines at Dui on the west coast. The Japanese, who for years had traded in the island, and had fished off the coasts, objected to the Russian annexation. For a time, however, an agreement obtained by which both parties had joint ownership, and permission to occupy uninhabited territory. In 1875, Japan gave up her claim to the south of the island in return for the cession of the Kuriles, and an annual payment for a number of years. As a result of the recently-concluded war, Japan regains her former possessions.

The Russian occupation at the present time practically only extends to the district enclosed in a radius of thirty miles from Alexandrovsk on the west coast, and another smaller one around Korsakovsk in the south.

With the advent of the Japanese comes new promise for the island of despair. Its products of forest, mine, and sea will doubtless be developed; agriculture will be fostered, and the Japanese administration will certainly put to shame the rankly corrupt methods of the Russian prison-governors.

What is now a den of infamy, a land of terror and sin, will doubtless develop in the capable hands of our energetic allies in the East into a prosperous, orderly, and productive region, and that before many years have rolled away.

THE REFORMATION UNDER HENRY VIII.

BY HENRY SMART, M.A.

"Never came reformation like a flood,
With such a heady current, scouring faults,
As by this king."

GUIDANCE in studying this question and clearness of thought concerning it may be obtained by noticing that reformation went on in three directions, in government, in worship, and in doctrine. It has been pointed out[1] that in this respect the Reformation in England pursued a course exactly opposite to that which it followed in Scotland. In England the Reformation was a royal movement, and therefore the order of reformation was government, worship, doctrine. The first step, both under Henry and under Elizabeth, was an Act of Supremacy; and the issue of the Thirty-nine Articles was never reached under Henry, and, under Elizabeth, came some years after the Act of Supremacy. In Scotland, on the other hand, the Reformation came from below, and began with doctrine.

From the time of the Conqueror, Papal power and influence in this country grew steadily. Before that time there had been little interference on the part of Rome, though Offa instituted the payment of Peter's Pence, and from the time of Dunstan the archbishops went to Rome for their palls. But the Conquest was accomplished under the blessing of the Pope, and Papal power in England increased in spite of the strong will of William I. It reached its highest point under John, when Innocent III. was Pope, and from that time steadily declined. Many attempts were made to throw off the Papal yoke, chiefly on account of the large sums of money which were drawn out of the country. Under Henry III. there were frequent complaints of the extortions of the legates, and Edward I. outlawed the clergy for trying to obey the bull "Clericis Laicos." Under Edward III. further steps were taken; the Statutes of Provisors and Præmunire were passed, and in 1366 the arrears of the annual tribute of 1000 marks, promised by John and due since 1333, were refused, and the tribute was never again paid.

During this century, the fourteenth, the feeling against the Papacy was strengthened by the Babylonish Captivity. In 1309 the Pope left Rome and took up his residence at Avignon, where the Popes lived till 1377. During that time they were justly regarded as creatures of the French court, and naturally much indignation was felt that money should be drawn from this country to support the friends of our antagonists. In 1377 Gregory XI. went back to Rome. But on his death two Popes were elected, one at Rome, and another at Avignon. Thus began the Great Schism, which was not closed till the Council of Constance. It is easy to see what discredit these events brought upon the Papacy. But even then relief from Papal oppression was difficult to obtain. Kings had found it well to remain on good terms with the Pope, for from him they could obtain relief from promises made to their subjects; and under Richard II. advantage was twice taken of the Great Schism to get rid of inconvenient ecclesiastics by translating them from England, where the authority of the Pope of Rome was acknowledged, to Scotland, where that of the Pope of Avignon was recognised.

There was thus a national feeling against the Pope. Even under John it was felt that the King degraded himself by his submission—"He has become the Pope's man"—and as national feeling grew, and the character of the Popes declined, the objection to Papal interference became stronger. Much discontent, too, was felt at the wealth of the Church, though most varied estimates are given as to the amount of land in church hands—from half to one-fifth of the land of the realm. The Statute of Mortmain had aimed at stopping this accumulation of land in the hands of the Church, and the Unlearned Parliament of 1404 proposed to confiscate it. Discontent was loudly expressed at the rapacity of the clergy; the complaint was that nothing could be had without payment, while everything could be had for money; baptisms, marriage, probate, even the sacrament to the dying, all had to be paid for, and Motley gives an interesting if not an edifying picture of the way in which crimes could be atoned for by a money payment.

A further cause of dissatisfaction was in the character of those appointed to benefices. Ignorant persons were frequently appointed, some of whom could not even read, and sometimes foreigners who did not understand English. Some bishops even took an oath of those they ordained that they would learn Latin, the language in which the Church services were performed. The higher posts in the Church were often filled by men who were quite unfit for their office. We read of a youth who became Dean of Lincoln about the year 1510, who had a Papal dispensation to hold any office short of a bishopric at the age of sixteen.

[1] See *Queen Elizabeth*, by E. S. Beesly, M.A.

The hunting and hawking bishops were a frequent object of sarcasm. Kings took advantage of the wealth of the Church to reward their servants with bishoprics and abbacies. Wolsey held three bishoprics. This encouraged the practice of non-residence. Wolsey's predecessor at York lived at Rome, as did also the Bishop of Worcester, who, by the way, was an Italian. That the clergy had neglected their duty was plain from the appalling ignorance of the people. Bilney, who was put to death by the Bishop of Norwich in 1532, declares that he found many ignorant of the resurrection of the dead.

The character of those who ruled the Church during the last years of the fifteenth century and the early part of the sixteenth doubtless had much to do with the desire for reform. During that time the Papal throne was occupied by men who certainly were unfit for their high office. Among them were Alexander VI., probably the worst of the Popes; Julius II., "the Incendiary of Christendom;" and Leo X., "Let us enjoy the Papacy, since God has given it to us." Amongst the charges brought against them were nepotism, bribery at elections, and the sale of offices. Entering the arena of political strife, they used the political methods of the sixteenth century—lying and deceit. Wolsey knew how Papal elections were managed. On the death of Leo X., he offered to find 100,000 ducats if Charles would move his troops against Rome and order the Cardinals to elect him. Colet prayed, "O Jesu Christ, wash for us not our feet only, but also our hands and our *head*."[1]

The first steps towards Reformation came from Wycliffe. In the time of Richard II. his followers were very numerous. But the close alliance of Henry IV. and Henry V. with the Church led to a persecution of the Lollards, and little is heard of them after the death of Sir John Oldcastle. Wycliffe's followers did not disappear, but when in danger generally recanted, so that few were put to death.

The great change in the government of the Church effected by Henry was the abolition of the Papal Supremacy. The immediate cause of this was the divorce question. There is no need to stay on this matter. The one thing to be said in Henry's favour is that it was highly desirable that he should leave a son to succeed him. The demands he made of the Pope were outrageous. A most ample dispensation had been obtained by Isabella, Catherine's mother, before she would allow Catherine to marry Henry, and Henry knew this. Yet he wished the Pope to declare the marriage null from the beginning, because he had married his brother's widow. Only one other point need be noticed here. It seemed strange to the people that the king should be cited before a foreign legate in his own country.

Henry married Anne in January 1533, and in the following May Cranmer pronounced his sentence of divorce. Henry thus followed the advice of Clement, who had counselled him to marry Anne without waiting for the divorce. Two Acts were closely connected with this affair. In 1533[2] the ground had been prepared, and safety ensured as far as possible, by an Act forbidding appeals to Rome. Afterwards came the natural sequel, the Royal Supremacy. Wolsey had told Clement that he would lose England if he did not agree to the divorce. In 1531 the clergy in Convocation addressed Henry as Head of the Church, with the saving clause, "as far as is consistent with the law of Christ." This acknowledgment was forced from them by fear lest they should incur the penalties of Præmunire on account of their having acknowledged the legatine authority of Wolsey. In 1533 the King's Council decided to call the Pope "the Bishop of Rome," and in 1535 came the Act of Supremacy—"the king's majesty justly and rightfully is, and ought to be, supreme head of the Church of England; and so is recognised by the clergy of this realm in their convocations; . . . be it enacted . . . that the king, our sovereign lord, his heirs and successors, kings of this realm, shall be taken, accepted, and reputed the only supreme head on earth of the Church of England." This was Henry's answer to the Pope. The latter had disallowed the divorce, and in 1534 had declared the marriage with Catherine valid. Henry now broke with Rome, and the Pope was found powerless to punish him—a great change from the time of Henry II. The title "Supreme Head" gave offence to some, and under Elizabeth it was changed to "Supreme Governor," but Cranmer declared that it simply meant that the king was at the head of the English people in all matters, ecclesiastical as well as temporal.

There seems no doubt that this assumption on the king's part was acceptable to the people of England. It was favoured even by Gardiner and Bonner. Pole issued a book in 1535 called a "Defence of the Unity of the Church," calling on Charles V. to invade England, and declaring that the people of England were ready to help him. But Gardiner and Bonner denied this, saying that Henry had introduced no new thing, and decrying "the falsely pretended power of the Bishop of Rome." Even Tonstall, Bishop of Durham, who hesitated to acknowledge Henry as Supreme Head, declared that in throwing off the authority of Rome Henry had restored the Church to her ancient freedom. It is important to distinguish between the feeling against the Pope and that against the Church. The Act of Supremacy was a blow aimed at the Pope, and was acceptable to many who were utterly opposed to all other changes. There had been an anti-papal feeling in England some centuries before there was an anti-clerical one.

A natural outcome of the Act of Supremacy was the abolition of the payment of Annates. This custom, the payment by bishops and archbishops of the first year's revenue to the Pope, had been introduced by the legate Pandulf in the time of Henry III. In 1532 Parliament abolished this payment, declaring it to be "an uncharitable custom, grounded upon no good or just title." This touched the Papal purse, and the Papal treasury at this time was always low. It was intended as a threat, for it was left to the king to bring the Act into operation. Henry did so in 1534, and from that time, with the exception of Queen Mary, the sovereigns of England enjoyed the proceeds till they were given up by "good Queen Anne."

Two other most important changes were made in the government of the Church during this reign. The first was in 1533, when it was ordained that Convocation was to make no new canons without the king's consent, and a commission of thirty-two members, half lay and half clerical, was appointed to revise the existing canon law. Nothing, however, came of this latter decree during Henry's reign. The other change was in the method of electing bishops. These elections

[1] Quoted by Seebohm. [2] January.

had always been much under royal influence, and though John, in the hope of dividing his enemies, granted the Church freedom of election in 1214, and confirmed this by the first article of Magna Charta, yet kings, by their right of licence and approval, usually secured the election of their nominees. But in 1534 it was decreed that, on a vacancy occurring, the king was to grant a *congé d'élire*, with a letter naming the person to be appointed. If this person was not elected or not consecrated, the clergy were to incur the penalties of Præmunire. This Act still governs the election of bishops.

There were abundant reasons and excuses to be found for the dissolution of the monasteries, which went on from 1524 to 1539, an early start being made by Wolsey, who, with the Pope's consent, suppressed those with fewer than seven inmates. The reasons were that such a measure would break the power of the Church and give the king much treasure, which would enable him to dispense with parliamentary grants for some time to come. The excuses consisted in the abuses which undoubtedly went on within their walls. These were natural from the nature of the lives of the inmates and from the fact that, in general, monasteries were exempt from visitation by the bishop. William of Wykeham had intended to found a monastery; but, having examined those in existence, and compared them with the rules of their orders, he changed his mind and founded colleges. His example was followed by Archbishop Chicheley, William of Wainfleet, Henry VI., and Margaret of Richmond. Bishop Fox thought of founding a monastery, but a brother bishop said to him: "Beware of what you do; the monks have already more than they will be able to keep;" and Fox founded a college instead. Henry V. ordered a reformation of monasteries; and in 1490 the Pope ordered Archbishop Morton to urge the heads of monasteries to reform their houses. The archbishop's letter to the Abbot of St. Alban's speaks of immorality, waste, simony, and robbery of the monastery.

But although we may agree that the monasteries had outgrown their uses, and that their suppression was desirable, it does not follow that we approve the method adopted. Cromwell, the Vicar-General, to whom, in 1535, the commission of inquiry was issued, acknowledged that in politics he had only one plan—to find out the king's will and execute it. His servants, the commissioners, seem to have been of the same way of thinking. One of them is referred to by Hallam as "of infamous character," and was afterwards convicted of perjury in trying to obtain a conviction under the Statute of Six Articles. Another, named Layton, reported, "At Bruton and Glastonbury there is nothing notable. The brethren be so strict kept that they cannot offend; but fain they would if they might, as they confess; so the fault is not in them." Still, taking into consideration what was said in the preceding paragraph, the evidence of the commissioners cannot be rejected altogether.

Acting on this report, Parliament, in 1536, suppressed those monasteries whose revenues were less than £200, because "manifest sin, vicious, carnal, and abominable living, is daily used and committed commonly." The strange thing about it is that this Act was passed by a Parliament in which the spiritual peers outnumbered the lay ones, and where the mitred abbots formed one-third of the Upper House. The number suppressed was 376, and a Court of Augmentations was established to deal with the wealth thus secured. No further Act of Dissolution was passed; all other dissolutions were "voluntary." The larger monasteries had been commended, but during the next three years they were induced to confess their sins and surrender their houses. Some were unwilling, but the Abbots of Reading, Colchester, and Glastonbury were put to death, ostensibly for treason, really on account of their tardiness in surrendering, and this hastened on the surrender of the remaining houses. All that was then necessary was for Parliament to pass an Act granting to the king the revenues of those which had surrendered; this was done in 1539. The monastic cathedrals were remodelled, the chapter being placed under a dean instead of under a prior.

The gain that accrued to the king was not so great as it should have been. The total annual revenue of the smaller monasteries was £32,000, and that of all the monasteries was probably over £130,000. The movables of the smaller monasteries alone were valued at £100,000. But, owing to grants and sales on easy terms to courtiers, the king gained little in wealth. Instead of founding fifteen or eighteen new bishoprics, as he had intended, he founded only six. Some money was spent on roads and fortifications, but the king was not able to dispense with parliamentary grants for long. The Reformation gained strength by the interest which many new families thus had in the movement, and by the change it made in the balance between lay and clerical peers in the Upper House; but the Pilgrimage of Grace was a sign of the little wish the people had for reform, and of the pity they felt for the ejected monks. The economic effects of this change do not concern us here. Doubtless the dissolution of the monasteries was a great gain to Protestantism, but it is sad to think that both the means and the method adopted were bad. Cranmer felt the injustice of the king's taking the lands of all monasteries, whether of royal foundation or not, and Latimer wished that some might be preserved for the sake of education and charity.

The most important step towards the Reformation taken during this reign was the translation of the Bible. Wycliffe's version had appeared in 1382, but had been condemned; the attitude of the clergy being clearly shown by Archbishop Arundel's declaration of 1408, that no translation was to be used unless approved by a bishop or a provincial council. A further drawback to the use of Wycliffe's translation was its cost; in 1429 it sold for £2, 16s. 8d. During this reign we have permission granted to read a Bible which could be bought at a low price; Tyndale's New Testament was sold for 3s. 6d.

In 1516 Erasmus issued the New Testament in Greek and Latin, and expressed a wish that the Scriptures might be read by all, "not only by Scots and Irishmen, but also by Turks and Saracens." Tyndale's New Testament was printed abroad, at Antwerp or Worms. It appeared in 1526, and was translated from the Greek. It was carried to Oxford by a clergyman named Garret, and was eagerly bought by the people and bought up by the bishops, who wished to destroy it. Anne Boleyn possessed a copy of it; "I know her for a spleeny Lutheran," said Wolsey through Shakespeare, and doubtless her Protestant tendencies helped on the Reformation movement. Tyndale's version was condemned in 1530, but a translation was promised. Coverdale's Bible was also printed abroad, and was

made, not from the Greek, but from a comparison of the Vulgate with Luther's German translation. It appeared in 1535. The year before, Convocation had asked for a translation of the Scriptures, though Gardiner and some others opposed, and now, in 1536, Cromwell issued a declaration that every church should have a copy of the Scriptures in English. The next version to appear was Matthew's Bible (1537). This consisted partly of Tyndale's version and partly of Coverdale's, and took its name from a merchant who helped the undertaking. In 1539 appeared the Great Bible, which was approved by the king, the archbishop and Cromwell. The printing was begun in Paris and finished in London, and the work was superintended by Coverdale. But it is a striking fact that after the dissolution of the monasteries the Reformation movement ceased; and this reaction is seen in the two orders, that none should read aloud or expound without the permission of the king or the bishop, and that none under the degree of gentleman should read the Bible. Still the Scriptures had been issued in English, and the practice of reading them grew.

But little change was made during this reign in doctrine. The Reformation came from above, and the king, though glad to copy the example of some German states and throw off his allegiance to the Pope, was anxious to prove that the excommunication pronounced against him was undeserved. The people appear to have had little wish for doctrinal changes; and, considering their ignorance of doctrine and of the Scriptures, it is hardly to be expected that they should have had such a wish. Under Henry's strong will and firm hand uniformity was maintained, the climax being reached in the declaration, "it shall be lawful for all persons to read and teach such doctrine as is or shall be set forth by his majesty." When the Ten Articles appeared in 1536, mention was made of only three sacraments; but the Statute of Six Articles of 1539 was a great blow to the Reformers. It declared that "in the sacrament of the altar, after consecration, there remaineth no substance of bread and wine; but the natural body and blood of Christ are present under these forms." This was most uncompromising, and to deny it meant death by burning. The other articles declared communion in both kinds not to be necessary for all, and supported the celibacy of the clergy, the obligation of vows of chastity, the use of private masses, and the practice of auricular confession. Two books of doctrine were issued. One appeared in 1537, and was called "The Institution of a Christian Man." It was drawn up by the clergy, and was known as "The Bishops' Book." The other was issued in 1542, and was termed "A Necessary Doctrine for any Christian Man." As this had been examined by the king it was called "The King's Book." In both of these manuals the seven sacraments were maintained. Cranmer issued twelve homilies to be read by such priests as could not preach, but Latimer assures us that they did but little good. In 1544 a Litany appeared in English.

We may sum up by saying that Henry's work consisted in (*a*) throwing off the authority of the Pope, (*b*) breaking the power of the Church, and (*c*) giving the people the Bible in English. During the last seven years of his reign there was reaction, as is shown in the Statute of Six Articles and in the partial prohibition of reading the Bible. But at the last Henry seems to have prepared the way for further changes, for in the council nominated by him five weeks before his death to act for his young son, there was a large majority in favour of reform.

At this time there was no belief in religious toleration, and during the reign many lost their lives for conscience' sake. These were the days when rulers endeavoured to secure uniformity by means of persecution; later on came the endeavour to secure the same end by means of comprehension, and finally came toleration. More preached the last doctrine in his "Utopia," but when he saw the political results of it in Germany he was ready to enforce uniformity even by persecution. Clarendon says that Henry put more people to death for religion than did Mary. Catholics suffered for denying the Royal Supremacy and Protestants for denying Transubstantiation. It was for the former cause that Fisher and More suffered in 1535. When Henry married Anne, both were willing to swear to the change in succession, but not to declare the marriage with Catherine null from the beginning; and when they refused the Oath of Supremacy both were put to death, Fisher's death being probably hastened by the fact that Paul III. had recently made him a cardinal. More was the most lamented of Henry's martyrs. Erasmus says: "Whenever did nature mould a character more gentle, endearing, and happy than Thomas More's," and a modern writer[1] bears equally strong testimony: "A true saint without a touch of austerity, save that which he practised on himself in secret." John Houghton, the Prior of the Carthusians in London, was executed with three others for the same reason during the same year.

Of those put to death for denying Transubstantiation the most famous was Anne Askew. She was married, and had two children, but had been driven from her husband's home. Her answers to her judges were full of quotations from Scripture, and she left a full account of her trial. She suffered in 1546 with three others. Sometimes Protestants and Catholics suffered together, as when, in 1540, six clergymen suffered at Smithfield, three for denying the Royal Supremacy, and three for heresy. Frequently political motives mingled with religious, as in the case of the three abbots mentioned above, and in that of Elizabeth Barton, who was put to death with six others in 1534 for prophesying divine vengeance on the king if he married Anne. Colet was accused of heresy by the Bishop of London, but Warham protected him.

Something may be said as to the part played in these affairs by the prominent men of the time. First come the king and his two ministers, Wolsey and Cromwell. Henry was a vain and obstinate autocrat of no religious principles, but he showed the weakness of the Papacy, and he was responsible more than any one else for the changes of his reign. Wolsey and Cromwell both read his character, but Wolsey had a policy, while Cromwell had none; and consequently, while Wolsey tried to introduce his ideas into the king's mind, Cromwell merely tried to carry out the king's will. Wolsey was opposed to a doctrinal reformation, and ordered the bishops to search for and collect Luther's books. Yet, though not himself a good example of what a churchman should be, he wanted a reformation in discipline. Cromwell was a time-server. During his life he hastened on the Reformation, but at his death he declared that he died in the Catholic faith, not denying any sacrament of the Church.

[1] James Gairdner, C.B., LL.D.

Of the clergy of the day, Cranmer had a greater share in the Reformation than any one else, and certainly he is somewhat of a puzzle. He had a very difficult position, for, although he was widely read, and held very decided opinions, yet he might easily have ruined all by opposition to Henry. Moreover, he himself declared, "It pertains not to private subjects to reform things, but quietly to suffer that they cannot amend." He seems to have favoured a middle course himself, and appears to have had but little physical courage. Probably he would have escaped martyrdom under any sovereign but Mary. Colet and the other Oxford Reformers did much to advance the study of the Scriptures, but they were not with Luther in doctrine. Hugh Latimer lectured at Cambridge, and frequently preached before the king. He was a bold and honest man, and his death is all the more honourable to him from his advice to a young enthusiast named James Baynham: "It is not lawful for a man to consent to his own death unless he has a right cause to die in," and again: "I would be loath to suffer death, unless it were for necessary articles of my belief."

DEBATES IN SCHOOL.

BY ONE WHO HAS TRIED THEM.

IT was my good fortune to have charge for a year of an exceptionally bright class of children in the advanced department of an elementary school in the West of Scotland. They were twenty in number, their ages running from fourteen to sixteen, and it could not be said that there was a dullard among them—practically all of them being inclined to study. They were of the kind that causes a teacher to regard his work as a pleasure. Pleasure, indeed, it was to me, for while teaching them, I was benefiting myself more than I would have done had I been attending classes. Many things had to be looked over the night before, for it is wonderful how rusty one becomes in some subjects after a lapse from the study of them.

Conforming to the regulations, each pupil had a note-book in which were entered such things as would repay remembrance. These books became, in a short time, veritable encyclopædias, and it was my custom to lift one occasionally, and, just to train their memory, to ask questions on what I saw written. Sometimes a debate in miniature was held, as, for example, when I asked reasons for certain answers given; and it was this giving of reasons, this causing each pupil to think and dress his thoughts in proper garments, that led up to our first set debate. Some remark had been made about home lessons, causing me to inquire if they had too much to do at night. Conflicting replies were given, and it was suggested that we might have a debate on the whole subject—Should Home Lessons be given? We agreed to set apart the English hour on the following Friday for the purpose, and, as far as speakers were concerned, I agreed to wield the cudgels on behalf of those who wished a continuance of home lessons. One of the smartest of the boys agreed to lead the opposition.

The great day came, and as the hour approached I noticed many of the pupils referring to pieces of paper which, on inquiry, proved to be "speeches" which each one intended to deliver. I appointed myself chairman, and before opening the debate, intimated a few rules for the guidance of all who were taking part. There were to be no interruptions; each one was to address the chair; as far as possible, the "speeches" were not to be read, the paper to be used for reference only. This done, I said a few words in support of home lessons being given, pointing out, among other things, that at their age it was proper that they should cultivate habits of study outside school hours, that the time spent in school was hardly sufficient to enable us to cover the work required, etc., etc. Of course, it will be understood that I strictly limited my remarks, as I wished more particularly to ascertain what they had to say on the subject. My opponent then rose, and in an extremely clever, connected speech showed up the evils of home lessons—how boys must have some time for play—how some had to go messages and work after school hours, sometimes not finishing until eight, and it would not be fair to ask them to study after that hour—how that he thought school work should be done in school, and that if anybody was inclined to study afterwards, by all means let them do so. Others then rose, and the debate went on merrily for about an hour. Nearly every one took part, some resting content with saying perhaps only one sentence, while others required a full five minutes to unburden themselves. The rapidity with which a former speaker stood up to repel some insinuation cast by a later speaker, and the effective way he did repel it, caused no little amusement. They were very seldom at a loss for a word, and showed a keen debating spirit all through; in fact, one would have thought they had been at it for years, whereas it was only a first attempt. On the conclusion of the debate a vote was taken, the result in this case being a small majority for those who wished home lessons, but it was understood that they were to be given in moderation. On the whole, I had no reason to feel dissatisfied with the result of my experiment, and it was unanimously agreed that debates should be substituted for English on Fridays. For the next Friday, leaders and seconders were chosen, a subject fixed, so that every one had a week in order to prepare for the fray, which, in all the debates we had, they went in for right heartily.

I mentioned the subject of debates to my headmaster, and, as he was rather dubious about their success, he came and heard and even took part in the next one we had. He had no more doubts about the point—their advantages were obvious. They encourage the proper expression of thoughts; they encourage home work and reference to books of various kinds (it itself a very valuable point); the sympathy of the parents is enlisted, a factor that may be said to lighten indirectly the teacher's work; debates also encourage a healthy spirit of inquiry—in fact, in the case above mentioned, the resources of many of the other teachers were laid under contribution.

The debates were continued until the end of the session, even the Inspector expressing his approval of the innovation—an innovation which, in a very short time, left its mark on all the "debaters" when they were required to answer questions on other subjects in their curriculum.

REGULATIONS FOR SECONDARY SCHOOLS.

GEOGRAPHY—(*continued from page* 350).

SECOND YEAR.—TERM I.

(A.) The Great Oceans of the World, showing briefly their Relation to the Great Water-partings.

1. Revise the "Irregular Distribution of Land and Water," the "Great Ridge Water-Parting of the World" from Term I. of First Year course.

2. The Ocean—its vastness, continuity, and intercommunications.

(*a*) *Depth.*—Necessity of knowledge of depth, especially in vicinity and approaches to harbours, river mouths, and other shipping thoroughfares. Seafaring nations issue charts of depths. Point out value in traversing such waters as Baltic Sea (shallows) and Gulf of St. Lawrence (fogs).

Describe ordinary sounding line, "heaving the lead." Lord Kelvin's apparatus to ascertain depth without reducing speed of vessel; describe use of tube and pressure illustrative of depth. Blackboard sketch. Refer to *Challenger* and similar expeditions. Deep-sea soundings comparatively unimportant to mariners, but immense service in laying submarine cables.

Average depth of ocean, 2½ miles, or nearly six times average elevation of the land masses above sea-level.

(*b*) *Ocean Bed.*—Inequalities of ocean bed much less marked than corresponding diversities of land surface. Floor of ocean mainly gently undulating, but there are abysmal depressions that correspond almost with the greatest land elevations and of infinitely greater extent in area. So marked is this feature that to fill up the depressions would engulf all crust of earth above sea level together with 5 or 6 thousand feet below it. Cubical contents of ocean equals 14 times volume of land.

(*c*) *Temperature.*—Main fact: the temperature of the ocean less variable than that of the land; water warmer in winter and cooler in summer than adjacent land. Variation in temperature of surface water from 80° or 90° F. in the Tropics to 28° F. in Polar area. In warm regions temperature decreases with increase in depth; bottom layer icy cold owing to influx from the Polar basins, compensated for by overflow from tropical regions towards Poles. In Polar regions temperature of ocean increases with depth. Inclosed oceanic basins show nearer the same temperature throughout their depth; cut off from influx of cold, the mass gradually acquires about the same temperature throughout.

(*d*) *Composition.*—Chief constituents of sea-water. 3½ per cent. of saline matter in solution preserves waters of ocean from corruption. Increases density. (*Cf.* Dead Sea and swimming in salt and fresh water.) Value of increased density in floating vessels. Briefly discuss oceanic circulation with simple proofs as tending to keep ocean nearly uniformly salt. Note regions where local circumstances to the opposite, *e.g.*, Baltic, Mediterranean, and off mouths of great rivers, as Amazon, etc.

(*e*) *Uses and Advantages of the Ocean.*—Modifying effect upon climate. If less salt, increased evaporation and enlargement of Arctic areas. Facility of communication between the land masses. Great source of the rainfall upon which animal and vegetable life mainly depend. Food supply.

3. (*a*) Take each ocean separately in relation to adjoining continents, noting carefully the regional water-partings and their slopes to each particular ocean. Sketch-maps absolutely indispensable, and for the Atlantic Ocean at least the sand-tray should be requisitioned.

(*b*) *Atlantic Ocean.*—Area 33 million square miles; average depth 2½ miles; greatest depth 4½ miles, 80 miles north of St. Thomas. The great central ridge and its lateral offshoots at average depth of 100 fathoms. The telegraph plateau between Ireland and Newfoundland. The three great basins formed by the central ridge. The three deepest areas: south-west of Newfoundland, north-east of West Indies, and between Ascension Island and Pernambuco. Most of the continents rise from submarine plateaus; in the case of Europe the edge of the shelf lies about 180 miles west of Ireland. Note absence of islands throughout greater part of the Atlantic; the number of great rivers it receives. (*Cf.* Pacific Ocean in these respects.)

(*c*) *Pacific Ocean.*—Area 68 million square miles; average depth about 3 miles; greatest depth 5¼ miles, north of the Caroline Islands. Its numerous islands suggest a shallow ocean, but the opposite is the case. The Atlantic possesses one sounding of 4½ miles, and no others to approach it. In the Pacific there are numerous soundings of four and five thousand fathoms. Many of the islands rise almost sheer from depth of 3000 fathoms.

(*d*) *Indian Ocean.*—Area 25 million square miles; average depth 2¾ miles; greatest depth 3½ miles, between Java and the north-west of Australia.

(*e*) *Arctic Ocean.*—Area 4 million square miles. At one time considered shallow. Erroneous idea caused by presence of ridge from Shetland to Iceland. Depths of 1800 to 2000 fathoms have been sounded north of New Siberia. Arctic exploration: Sir John Franklin, Nansen.

(*f*) *Antarctic Ocean.*—Area 7 million square miles. Average depth probably less than 1500 fathoms. Opposite conditions to Arctic, whose depth increases from the Atlantic; Antarctic decreases towards the Antarctic continent. Recent exploration.

(B.) Winds.

Preparatory.—Prove existence of air by simple experiments. Briefly deal with horizontal and vertical extension. Common properties—compressible, elastic, expansible, weight and exertion of pressure.

1. Simple experiments to prove expansion of air when heated. Cold air, because it is heavier, displaces warm, giving rise to draughts and winds.

Particularly guard against notion that heated air rises and forms a vacuum into which rushes the colder air.

Wind is air in motion caused by differences of temperature and density with corresponding differences of pressure. A slight difference of air pressure gives rise

to a gentle breeze, increasing with the difference of pressure into high winds and violent storms.

2. Simple wind movements: land and sea breezes. Show how caused by experiment or diagram. Most marked in tropical regions. Land hotter than adjacent sea by day and colder by night; hence displacement owing to difference of temperature causing sea breeze by day and land breeze during the night.

Barometer is higher by day over the sea than over the land; at night the position is reversed. Winds always blow from regions of high pressure towards regions of low.

3. *Calm Latitudes.*—All the heat of the surface of the globe is derived from the sun, which is the great cause of variable temperature experienced by different regions of the earth. Extending round globe for distance of 6 or 7 degrees on either side of equator is a belt known as the "Zone of Calms." The belt of greatest heat is not continuous, nor is it constant, the "thermal equator" moving northwards in summer and back towards the equator in winter. The air within the belt is marked by great heat, varying in degree but slightly. Mention becalming of sailing vessels in these calm latitudes, which only escape by sudden gales due to electrical and other influences other than change of temperature.

4. *Trade Winds.*—Between the oscillating limit of the Zone of Calms, and about 28° N. and 25° S., for quite two-thirds of the earth's circumference are regions where winds blow from the east with almost unfailing uniformity. Refer to land and sea breezes above. Here same conditions obtain except upon a more gigantic scale. These winds, called Trade Winds, consist of the cooler air of the temperate and higher latitudes moving towards the equator to take the place of the rarefied air of that region.

In the northern hemisphere the trade winds blow from the north-east; in the southern from the south-east. If the earth were stationary the winds would blow directly from the north and south respectively. The rotation of the earth gives the winds an easterly twist. The trade winds fail before the equator is reached, blending insensibly into the belt of the calms.

Anti-trade winds are "return trade winds," which, after their ascent into higher regions of air, become cooled and sink towards surface of the earth.

Trade winds average 6½ miles an hour. Anti-trades 30 miles an hour—called "Roaring Forties" in the Pacific and Indian Oceans between 40° and 50° S.

5. *Monsoons.*—Monsoons differ from trade winds in that they are periodical instead of perennial. Monsoon blows from one quarter for half the year, and from opposite quarter for other half. Caused by the heating of the great land areas nearest the equator. Intense heat accumulates on the north of the equator for six months, and over the south of equator the succeeding six months. Show that monsoons are but modifications or reversal of the trade winds. Describe violent atmospheric disturbances that accompany the "breaking up of the monsoon," or the change from one monsoon to the other.

6. *Variable Winds.*—In the middle and higher latitudes of the globe the air currents present no such uniformity as in the tropical regions. The sun's heat is less in degree, and the increasing variation in the length of day and night at opposite seasons is an important factor. In the North Temperate Zone, too, the proportion of land to water is altogether different. These different conditions complicate the problem of atmospheric disturbance.

The prevailing winds are westward from about 30° N. and S. to the Arctic and Antarctic Circles, but they alternate with changing breezes and calms, occasionally interrupted by violent storms. These westerly winds are really compensating currents for the trade winds of the warmer regions.

Briefly consider the atmospheric conditions in the British Isles. Meteorological stations, and the useful purposes they serve. Distributions of air pressure. Isobars. Cyclone and anticyclone. Explain direction and force of wind in cyclone or low-pressure area; also in anticyclone or high-pressure area.

7. *Local Winds.*—Limited in area, but sufficiently persistent to affect climate of region where they occur—*e.g.* Mistral, a chilly northerly wind blowing often for days together down the valley of the Rhone; Bora, an icy wind from the Adriatic that blasts the Karst region of Austria; Föhn, a warm south wind that melts the Alpine snows so quickly as to cause serious inundations; Sirocco of Italy and Selano of Spain, hot winds from the African desert, tempered by the passage over the Mediterranean; Samill in Turkey, Khamsin in Egypt, Simoom in Arabia, Harmattan in Guinea, hot blasts from the Sahara differing in degree only by nature of its passage—*e.g.* mostly modified in Turkey by the width of the Mediterranean; and the same wind in Turkestan is known as the "Tebbad" or "fever wind." These terrible desert winds, when nearer to their source, are charged with particles of sand of burning and suffocating qualities.

8. *Storm Winds.*—Gale, hurricane, cyclone, typhoon, tornado, &c. Distinguish in degree and locality.

(C.) Tides.

Preparatory. — Simplest movements of the ocean, waves. Their cause and characteristic motions. Height and length of waves. Where largest waves experienced. Action of waves and breakers upon coast.

1. Consider varying conditions on beach or in estuaries of the level of water as marked by high and low tide, flood and ebb tide.

Tides.—The regular rise and fall in level of the sea at intervals of about six hours. Tide ebbs and flows twice a day. Waves are simply undulatory movements; currents, translatory. Tides partake of the nature of both.

2. *Principles of Gravitation.* — Especially note the force of attraction varies directly as the mass and inversely as the square of the distance. The solid earth attracted as a whole; the water on its surface attracted independently.

3. *Tidal Wave.*—The formation of the tidal wave at the point nearest to the moon; second tidal wave at point farthest from her. Illustrate by diagrams and the globe how the water envelope is changed from the spherical to the elliptical under the attraction of the moon.

Show the regions that experience high tides and those with low ones at any given time. Illustrate how every meridian experiences high and low tide in succession twice every day.

N.B. The whole matter rests upon a clear perception of the difference of attraction upon the earth as a whole and upon the water at nearest and farthest points from the moon.

4. *High Tide later each Day.*—Moon rises nearly one

REGULATIONS FOR SECONDARY SCHOOLS.

GEOGRAPHY—(*continued from page* 350).

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2. Simple wind movements: land and sea breezes. Show how caused by experiment or diagram. Most marked in tropical regions. Land hotter than adjacent sea by day and colder by night; hence displacement owing to difference of temperature causing sea breeze by day and land breeze during the night.

Barometer is higher by day over the sea than over the land; at night the position is reversed. Winds always blow from regions of high pressure towards regions of low.

3. *Calm Latitudes.*—All the heat of the surface of the globe is derived from the sun, which is the great cause of variable temperature experienced by different regions of the earth. Extending round globe for distance of 6 or 7 degrees on either side of equator is a belt known as the "Zone of Calms." The belt of greatest heat is not continuous, nor is it constant, the "thermal equator" moving northwards in summer and back towards the equator in winter. The air within the belt is marked by great heat, varying in degree but slightly. Mention becalming of sailing vessels in these calm latitudes, which only escape by sudden gales due to electrical and other influences other than change of temperature.

4. *Trade Winds.*—Between the oscillating limit of the Zone of Calms, and about 28° N. and 25° S., for quite two-thirds of the earth's circumference are regions where winds blow from the east with almost unfailing uniformity. Refer to land and sea breezes above. Here same conditions obtain except upon a more gigantic scale. These winds, called Trade Winds, consist of the cooler air of the temperate and higher latitudes moving towards the equator to take the place of the rarefied air of that region.

In the northern hemisphere the trade winds blow from the north-east; in the southern from the south-east. If the earth were stationary the winds would blow directly from the north and south respectively. The rotation of the earth gives the winds an easterly twist. The trade winds fail before the equator is reached, blending insensibly into the belt of the calms.

Anti-trade winds are "return trade winds," which, after their ascent into higher regions of air, become cooled and sink towards surface of the earth.

Trade winds average 6½ miles an hour. Anti-trades 30 miles an hour—called "Roaring Forties" in the Pacific and Indian Oceans between 40° and 50° S.

5. *Monsoons.*—Monsoons differ from trade winds in that they are periodical instead of perennial. Monsoon blows from one quarter for half the year, and from opposite quarter for other half. Caused by the heating of the great land areas nearest the equator. Intense heat accumulates on the north of the equator for six months, and over the south of equator the succeeding six months. Show that monsoons are but modifications or reversal of the trade winds. Describe violent atmospheric disturbances that accompany the "breaking up of the monsoon," or the change from one monsoon to the other.

6. *Variable Winds.*—In the middle and higher latitudes of the globe the air currents present no such uniformity as in the tropical regions. The sun's heat is less in degree, and the increasing variation in the length of day and night at opposite seasons is an important factor. In the North Temperate Zone, too, the proportion of land to water is altogether different. These different conditions complicate the problem of atmospheric disturbance.

The prevailing winds are westward from about 30° N. and S. to the Arctic and Antarctic Circles, but they alternate with changing breezes and calms, occasionally interrupted by violent storms. These westerly winds are really compensating currents for the trade winds of the warmer regions.

Briefly consider the atmospheric conditions in the British Isles. Meteorological stations, and the useful purposes they serve. Distributions of air pressure. Isobars. Cyclone and anticyclone. Explain direction and force of wind in cyclone or low-pressure area; also in anticyclone or high-pressure area.

7. *Local Winds.*—Limited in area, but sufficiently persistent to affect climate of region where they occur—*e.g.* Mistral, a chilly northerly wind blowing often for days together down the valley of the Rhone; Bora, an icy wind from the Adriatic that blasts the Karst region of Austria; Föhn, a warm south wind that melts the Alpine snows so quickly as to cause serious inundations; Sirocco of Italy and Solano of Spain, hot winds from the African desert, tempered by the passage over the Mediterranean; Samill in Turkey, Khamsin in Egypt, Simoom in Arabia, Harmattan in Guinea, hot blasts from the Sahara differing in degree only by nature of its passage—*e.g.* mostly modified in Turkey by the width of the Mediterranean; and the same wind in Turkestan is known as the "Tebbad" or "fever wind." These terrible desert winds, when nearer to their source, are charged with particles of sand of burning and suffocating qualities.

8. *Storm Winds.*—Gale, hurricane, cyclone, typhoon, tornado, &c. Distinguish in degree and locality.

(C.) Tides.

Preparatory. — Simplest movements of the ocean, waves. Their cause and characteristic motions. Height and length of waves. Where largest waves experienced. Action of waves and breakers upon coast.

1. Consider varying conditions on beach or in estuaries of the level of water as marked by high and low tide, flood and ebb tide.

Tides.—The regular rise and fall in level of the sea at intervals of about six hours. Tide ebbs and flows twice a day. Waves are simply undulatory movements; currents, translatory. Tides partake of the nature of both.

2. *Principles of Gravitation.* — Especially note the force of attraction varies directly as the mass and inversely as the square of the distance. The solid earth attracted as a whole; the water on its surface attracted independently.

3. *Tidal Wave.*—The formation of the tidal wave at the point nearest to the moon; second tidal wave at point farthest from her. Illustrate by diagrams and the globe how the water envelope is changed from the spherical to the elliptical under the attraction of the moon.

Show the regions that experience high tides and those with low ones at any given time. Illustrate how every meridian experiences high and low tide in succession twice every day.

N.B. The whole matter rests upon a clear perception of the difference of attraction upon the earth as a whole and upon the water at nearest and farthest points from the moon.

4. *High Tide later each Day.*—Moon rises nearly one

hour later each evening; moon's movement along her course 12° a day. Earth has to rotate once + this 12° to reach the tidal wave. To rotate 12° occupies 48 minutes.

5. *Spring and Neap Tides.*—When they occur. The sun and moon attracting in the same direction; attracting at right angles. Difference in the attractive power of each caused by difference of distance from the earth.

6. *Course of Tidal Wave.*—Varying proportions as in the Southern Ocean compared with Bay of Fundy. Little effect in open ocean. Double tides at Southampton; double tides at Havre arrive almost simultaneously, causing high water for three hours. Almost tideless areas, as Baltic and Mediterranean. Bores and races; example of each, Bristol Channel and Pentland Firth.

(D.) Currents.

Winds not only produce waves, but where they blow steadily in a definite direction they give the surface water a steady drift or current.

A plain map of ocean currents highly important.

1. Ocean currents are surface streams of sea-water, practically rivers in the sea, whose beds and banks are themselves sea-water. In addition to wind, currents are also caused by differences of temperature at different parts of the ocean, and the revolution of the earth, the fluid moving more quickly than does the land which it washes.

2. *Contrast Waves and Currents.*—Waves undulatory, changeable, and rapid. Currents translatory, constant, or periodic and slow.

3. *Currents of the Atlantic.*—North Equatorial, the Gulf Stream, South Equatorial, the Brazil.

Show how the Equatorial is the result of the rotation of the earth affecting the drift of the water, just as it affects the direction of the trade winds.

Pay particular attention to the Gulf Stream, its origin, course, and particularly its effect on the climate of Western Europe.

The Sargasso Sea.

4. *Currents of the Pacific.*—Equatorial, Japan, Mexican, Australian, and Peruvian. Compare the Japan Current and the Gulf Stream.

5. *Currents of Indian Ocean.*—Equatorial, Mozambique, and Agulhas.

6. *Currents of the Arctic and Antarctic Oceans.*—Trace the Labrador Current, and its blighting effect on the coast of Labrador. The fogs and icebergs in the neighbourhood of Newfoundland.

7. By observation and experiment show expansion of water under heat. Lightness of warm water, bulk for bulk, compared with cold.

Describe Dr. Carpenter's experiment to illustrate oceanic circulation.

Movements set up by warm water of the Tropical regions overflowing towards Polar regions, whose colder waters set in towards the Tropics.

8. *Effects of Ocean Currents.*—Marked effect on climate.

Currents from Equatorial regions transfer warmth to the regions towards which they set in; Polar currents, the reverse effect. Compare winter temperature of north-west of Norway with the Baltic Sea and the Crimea still further south; show connection with the Gulf Stream.

Currents greatly assist in maintenance of the purity and uniform composition of the waters of the ocean. Captains of sailing vessels shape their course so as to take advantage of favourable currents. Trace voyages from this point of view.

(E.) Finding Position at Sea.

1. *Latitude and Longitude.*—Parallels and meridians. Given latitude and longitude, to find places on the map. Discuss greater difficulty in having to ascertain exact location of a spot without having a knowledge of either. The necessity of mariners to locate their position on the trackless main at any given time, say in the Atlantic.

2. *Zenith and Horizon.*—Explain complementary angles. Chronometer, and how to use it.

3. *Taking Observation of Longitude.*—By observation ascertain exact moment when the sun reaches its highest point. Compare with Greenwich time, as indicated by the chronometer, to note the difference in time. A difference of one hour equals 15° of longitude.

4. *Taking Observation of Latitude.*—The sextant, and how to use it. Ascertain the sun's altitude, or the angle between the sun and the horizon. By means of Nautical Almanac find the declination of the sun on the particular day. For example, sun's altitude 70°, declination 10°. Subtracting this from the altitude ("correcting the observation") gives us 60°. The complementary angle is 30°, and the required position is 30° N. latitude.

NOTES.—Too much emphasis cannot be laid upon the necessity of frequent experiments to illustrate points arising in the lesson. Maps and charts or blackboard sketches should be freely used. There are numerous text-books on physical geography available, but it is unadvisable to solely rely upon any one book. Matters elaborated in one may be briefly dismissed in another. Exactly suited to the needs of the teacher are Gregory's *Advanced Physiography* (Nelson and Sons), with an elementary edition for scholars' use; Hughes' *Physical and Astronomical Geography* (Philip and Son); and Cowham's *Graphic Lessons in Physical and Astronomical Geography* (Westminster School Book Depôt). This last contains a wealth of diagrams and suggestive experiments of immense value to the busy teacher.

Women Teachers.—The question of the employment of women as teachers formed one of the most important questions debated by the Saxon Teachers' Union in a Conference held at Eisleben not long ago. Herr Wigge argued the question with true German thoroughness, and from the point of view which is held largely, if not mainly, in German educational circles, where the employment of women teachers is only tolerated as an unavoidable necessity. Woman, argued the speaker, is meant by nature to be mother and housewife, and so until the physiological difference between man and woman can be got rid of, the practical equality of the sexes is utopian. The profession of teaching does not lie within the circle of those employments for which woman is fitted by nature, as this profession demands the greatest possible objectivity, whereas woman by nature is subjective. The woman teacher neither presents nor does she solve any problem of pædagogy. Owing to the dearth of teachers she is driving the man out of the towns, so that it is gradually becoming a case of the schoolmistress in the towns as opposed to the schoolmaster in the village.

NELSON'S BIBLE WALL PICTURES (Coloured).

FIRST SERIES.

NOTHING is more remarkable in modern methods of education than the large part played by pictures as an aid to the imagination. We are no longer content with the written word; we feel that for ourselves, and for our children too, it is above all things important that the mind shall have a groundwork of fact upon which to build. History lends itself especially to this treatment; but it is found by actual experience that pictures assist marvellously in the power of visualising poetical allusions. And without this visualisation, history and poetry alike lose half their charm; for these mental pictures are the woof and the warp with which the mind gradually weaves fair images, which, in many senses, surpass the hard material fact.

It is important, therefore, to provide good pictures, and especially so for children, since we all know from our own experience how the memory of pictures seen in childhood persists. When the subject is so vital a one as Biblical history, no pictures can be too good: the greatest artists of all times have spent themselves in the endeavour to illustrate worthily these great themes.

OUR LORD IN THE CARPENTER'S SHOP AT NAZARETH.

But many of these pictures are unsuitable for children because the artists did not scruple to paint sacred personages dressed in the habits of the countries where the pictures were painted. For children, surely, there should be some attempt to give the true Eastern setting; dress, architecture, and landscape alike should at least conform to this prime necessity.

Messrs. Nelson have borne this well in mind in drawing out their Biblical wall pictures. Throughout this first series the children are brought face to face with people of the East; there are glimpses of landscape that differ widely from the country they are accustomed to see in their rambles about the fields; the buildings have all the charm of novelty.

But this might easily have been done in a hard and perfunctory manner. Messrs. Nelson, with their wide experience, have not forgotten to use the charm of colour; and their successful use of the very modern "three-colour" process enables them to follow more closely the original intention of the artist.

Some of the present series are to be sold mounted on card. It would be difficult to find more suitable decorations for the school walls even from an artistic point of view. The pictures are not merely useful as a groundwork upon which the teacher builds, but (these selected ones especially) must always be delightful to the children.

It is impossible here to take the whole *seriatim*, but there are some that deserve more particular attention. "THE INFANT JESUS AND THE SHEPHERDS," with its suggestion of light, its suggestive composition, and its happy colouring; "THE WISE MEN OF THE EAST," well drawn, graceful, and full of quiet dignity; "THE BOY JESUS IN THE TEMPLE," —a picture that reproduces the dress and ornaments of the priests, and surrounds the group with an Oriental air, and is, at the same time, well drawn and coloured; these are all capital for their purpose. One of the most delightful of the series is "THE BOYHOOD OF JESUS AT NAZARETH." It represents the interior of the carpenter's shop, with Joseph, Mary, and Jesus. Through an opening a touch of blue sky is seen bright above white glistening houses. A palm-tree bends lightly, and a few leaves of a trailing vine hang before the window. These are the happy background to a scene that must appeal to every one for its quiet charm. The figure of the Son carrying two pieces of wood in his arms is excellent, both for its absence of *pose*, and for its suggestion of quiet thoughtfulness.

We heartily commend the series to the attention of teachers in want of an effective coloured series of Biblical illustrations. Messrs. Nelson will be issuing shortly a syllabus (with cuts), and teachers may judge, somewhat, from these, of the excellence of these new pictures as aids to the Scripture lesson.

Our Modern Language Section

FRENCH PRIZE COMPETITION.

RULES.

1. All translations should be **posted not later than February 8th, 1906**, and addressed:—PRIZE EDITOR, Office of the *Practical Teacher*, 35 and 36 Paternoster Row, London, E.C.
2. Competitors should cut out and send the Coupon which appears on the Back Wrapper page of the current number.
3. Competitors should write pseudonym only on MS. Prize-winner will be asked to send name and address for publication.
4. No competitor may take the prize offered more than once in three months.

A Prize of Half a Guinea is offered for the best rendering into English of the following extract:—

Exagération à part, je suis dans le vrai. L'homme va chercher à la tragédie un plaisir qui naît pour l'homme du malheur de l'homme.

Aussi bien, voyez-vous au théâtre, quel qu'il soit, la peinture du bonheur? Jamais! Comédie, Tragédie. Comédie: peinture des malheurs ridicules. Tragédie: peinture des malheurs terrifiants. Peinture du bonheur, où? Nulle part. Si l'homme "curieux de spectacles" comme dit Bossuet, "et qui s'en fait un de la peinture de ses erreurs" aimait le spectacle du bonheur humain, il aurait créé un genre dramatique consacré à la peinture du bonheur: ce genre dramatique n'existe pas. La conclusion s'impose. On a dit, spirituellement: "Pourquoi toutes les comédies finissent-elles par un mariage? Parce que, après, c'est la tragédie qui commence." Ce n'est pas mal; mais ce n'est pas complet. Ce qu'il faut dire c'est que la comédie elle-même est peinture de malheur. Elle est, même quand elle n'est pas satirique, même quand elle est sentimentale, constituée par les petites infortunes de deux jeunes gens qui voudraient s'épouser et qui ne le peuvent pas. Dès qu'ils le peuvent, c'est fini. Oh! baissez le rideau. Ils vont être heureux: je m'en vais. Voilà qui n'a plus aucun intérêt pour moi. Jamais un auteur dramatique n'a peint une lune de miel, si ce n'est au moment où elle commence de s'aigrir.

ÉMILE FAGUET.

RESULT OF THE JANUARY COMPETITION.

The prize is awarded to "Fittick." (Will "Fittick" please forward name and address for publication?)

First Class.—Agaznog, Eicarg, C. E. M., Shakspere, Bog-violet, Quis, Monq, Violette, Esther, Bees, E. S. L. A., Rita, Georgina, Hazlewood, Carol, Winnowsty, Brun, Summerbank, Comet, J. M. R., Oro, Q. L. A., Jonathan, Carpe diem, Couturier, Aimée, Canossa, Caen, Wen Racy, Gawayn.

Second Class.—Chaos, L'élève, Witenagemot, E. R. J. K., Kettering, T. V. D., Mie, Amitié, Florett, Teddy, Creechy, M. B., Ceylon, Missoo, Iris, Bluebell, Nylmat, La jeune fille, Omega, Narcisse.

Received too late for classification last month.—Caen, G. N., Grimbarian, Cœur-de-Lion, Josiah, Jan, L'insulaire, Patricia, Eucalyptus blossom.

Report.

Although there is no lack of awkward or improper renderings in the batch of papers just examined, the text only gave rise in two instances to anything like general errors. *La similitude de prison* refers to the fact that both Lavalette and the Duchesse d'Angoulême had been imprisoned in the Temple, which was not, as some candidates, relying on their dictionaries, translated it, a Protestant church. The reference to our competitors whether it would be advisable to insert the name of the work from which the prize extract is taken did not produce many replies, but they were all favourable to the course suggested. We shall therefore in future publish the name of the work as well as that of the author. Occasionally competitors do not remember that pseudonyms chosen should be short. One pseudonym this month consisted of three words made up of twenty-three letters. We have indicated it by the initials of the words chosen. Confusion sometimes arises by two competitors choosing the same pseudonym. Conor (S.) of last time was Conor (A.) of the previous month.

Prize Translation.

After this terrible scene Louis XVIII. retired to his own apartment. The Duc de Raguse took the unhappy Countess by the arms and conducted her, almost fainting, to her sedan chair, and thence to her home. Yet, when she had come to herself again, Madame de Lavalette still deceived herself with the hope of inducing the King to yield, and was ready to renew the hopeless attempt. Marmont, however, cherished no such mistaken idea. The opportunity had been too good, the circumstances too dramatic, for the King not to have availed himself of them if he had wished to show mercy. Nevertheless—and the Marquis deserves praise for such courageous fidelity to misfortune—he consented to try once more on the morrow.

The 19th of December was the Duchess of Angoulême's birthday, and also the twentieth anniversary of her release from the Temple. The memory of like misfortunes, the similarity of the prison, the excessiveness of the punishment, and the vindictiveness of the injudicious advisers of royalty, were all calculated to work upon the heart of a Princess who was believed to be the rigid slave of duty rather than of a cold and haughty nature. The Duchess thought that she ought to distrust the impulses of her heart, and to protect herself against the risk of being carried away by compassion if taken unawares. So the sentinels were doubled, and access forbidden to the doors leading to her rooms. An unnecessary precaution, as it turned out, for, at the foot of the state staircase, Madame de Lavalette and the Marshal were stopped and requested to withdraw.

But so excessive was the Countess's simplicity that even after her return from this ill-fated experiment, she still deluded herself with phantom hopes, saying to the Duc de Raguse—"They mean to pardon my husband only on the very scaffold."

FITTICK.

The Practical Infant-School Teacher.

SCHOOL GARDENING FOR LITTLE CHILDREN.

BY LUCY R. LATTER.

PART X.

"The end crowns all."

I HAVE shown, in my previous articles, the place which gardening should hold in a good system of infant education, and also what a vast store it offers for us to draw upon in the rest of our work with the children. It now remains to me to show more particularly the effect of gardening upon the child, the school, and society at large, and whether that effect be of such value as to demand the special attention of the educational authorities with a view to the providing of suitable gardens for every school, as well as opportunities for the cultivation of the same by the children as part of their school-work.

In dealing with the effect of gardening upon the children, we must keep in view their threefold nature, and remember that, although the physical, the intellectual, and the moral sides exist throughout, one side is more predominant than the others at a given time in the development of the human being. In the earliest years the physical nature is more to the fore. Gardening is an outdoor occupation. The child is, therefore, continually in the fresh air, and one has only to watch him when engaged in the work to see how thoroughly he enjoys it. His whole heart and soul are involuntarily thrown into it, and no task seems too much for him, so does "the labour we delight in physic pain."

The child's labour in the garden involves a variety of movements, and affords a natural outlet for much of that physical energy which, if left unprovided for, leads to rough play and unruly practices, and, later, even to hooliganism itself. Again, the child is unconsciously impressed by the sight of the pretty flowers, the graceful insects, and other wonderful little creatures which share the life of the garden; by the fragrance of the flowers, and the smell of the ground after a storm of rain, and by the beauty of the heavens. He listens to the songs of the birds; to the sound of the wind, now soft, now shrill or loud. He tastes the fruit of some of his labours. And so, by means of his eyes, his nose, his ears, his mouth, and his hands, his senses are all thus trained in a natural way, without any effort, and a host of delightful experiences are gathered the while, as a basis for further development. It is mind acting through ultimates and creating the next step above. The same process goes on all through life. Development may, therefore, be defined as "the action of the highest in and through the lowest for the production, in successive order, of all degrees above that lowest or ultimate."

Loving contact with, and care for, some of the wonderful things of Nature around him awakens in the child a strong feeling for the wonderful and the beautiful. This feeling reacts upon the child, and refines him. No child who has ever tended and watched the tiny seeds which he has put into the earth develop and put forth leaves, flowers, fruit, and seed will ever afterwards ruthlessly tear any flowers to pieces. Similarly, no child who has ever followed the wonderful life-history of some of the lowly creatures which he meets with in the garden will ever trample purposely upon a worm or a snail, still less will he have any pleasure in catching butterflies and sticking them on pieces of cork, merely to make a collection. He will rather respect and protect the lives of such marvellous creatures. From a love and care for the things of Nature the child rises to a deeper love and respect for his comrades and others, and through that again to a recognition of the all-wise loving Father, the Giver of all good things. From the Visible to the Invisible is the only way. Respect for plants and animals awakens respect for their environments, and this ultimately leads to respect for the neighbour's property.

The sights and sounds which afford the child gardener so much physical enjoyment, and appeal so tenderly to his heart, awaken a desire to know something more about the inhabitants of his garden, and also of the phenomena which affect it. The intellectual side of the child's nature now claims its due, and for the cultivation of the power of observation there is no better field than the school garden, where the minutest fact observed leads to the desire on the part of the observer to know the "why," "wherefore," and "how" of things. He will already have tried to express what he has observed with pencil or chalk and paper, or some other material. Now the time comes when the child will be ready and eager to master the art of reading in order to learn more and more of Nature's secrets.

Let the number of lessons be based upon the number and size of the beds and paths in the garden; upon the height of the various plants; the number of buds and full-blown flowers on a stem; the quantity of seed yielded by various plants; the amount of time required to dig up the potatoes in one bed, in two or more beds of equal size, etc., and arithmetic will appeal with ever new interest to child and teacher alike.

Each hour spent in work in the garden means the opening of a fresh door for the child in the realms of Science. Neither will this close the doors of Art and Literature to him. Nature is still the great artist and the great poet. We have made a dreary workshop of life; let us now make a beautiful palace of it once more.

But the child is only a unit of the school, and the school is but a part of the community. If each individual of the former is being more or less developed in the way I have tried to show, by gardening and communion with the things of Nature, the school as a whole, and the community as a whole, must also each be the better and the richer for such training of its members. I do not say that gardening is a panacea for all the ills of the world, although, doubtless, it is for the most of them, but there can be no question that the community which fosters gardening, in its highest and best sense, will enjoy a richer, fuller, and less selfish life; for the culture of the intellect will not then be pursued at the expense, or to the exclusion, of the culture of the heart.

It behoves the educational authorities, then, to insist that a garden shall be attached to every school, and that proper opportunities shall be afforded for the cultivation of the same by the children during school hours, and, therefore, as part of their school work, nay, as the centre for all the rest of the secular work of the school. We have human beings to train, not machines to guide; behind these human beings there is a boundless "flux of power eternally the same. It rolls in music through the ages, and all terrestial energy—the manifestations of life, as well as the display of phenomena—are but modifications of its rhythm," proclaiming ever

"The Hand that made us is divine."

THE STORY OF A LEAF.

1. First a tiny bud appears,
   In the Autumn weather;
   Then the leaf which stands below,
   Floats off like a feather.

2. All the Winter time the bud
   Snug and warm is keeping,
   For a thick brown overcoat
   Wraps him round while sleeping.

3. By-and-by the trees are roused
   By the fairy voices;
   "Wake," they sing; "The Spring has come,
   All the world rejoices."

4. Then the bud begins his work,
   Growing night and day time,
   Till a tiny leaf unfolds,
   Longing for a play time.

5. All the Summer time the leaves
   Dance and play together,
   Giving shelter to the birds
   From the rainy weather;

6. But at last the Autumn comes,
   Bringing nights so dreary;
   And the wind calls to the leaves:
   "Little leaves so weary,

7. "I will take you in my arms—
   Cruel to you never—
   And will bear you to the ground,
   There to rest for ever."

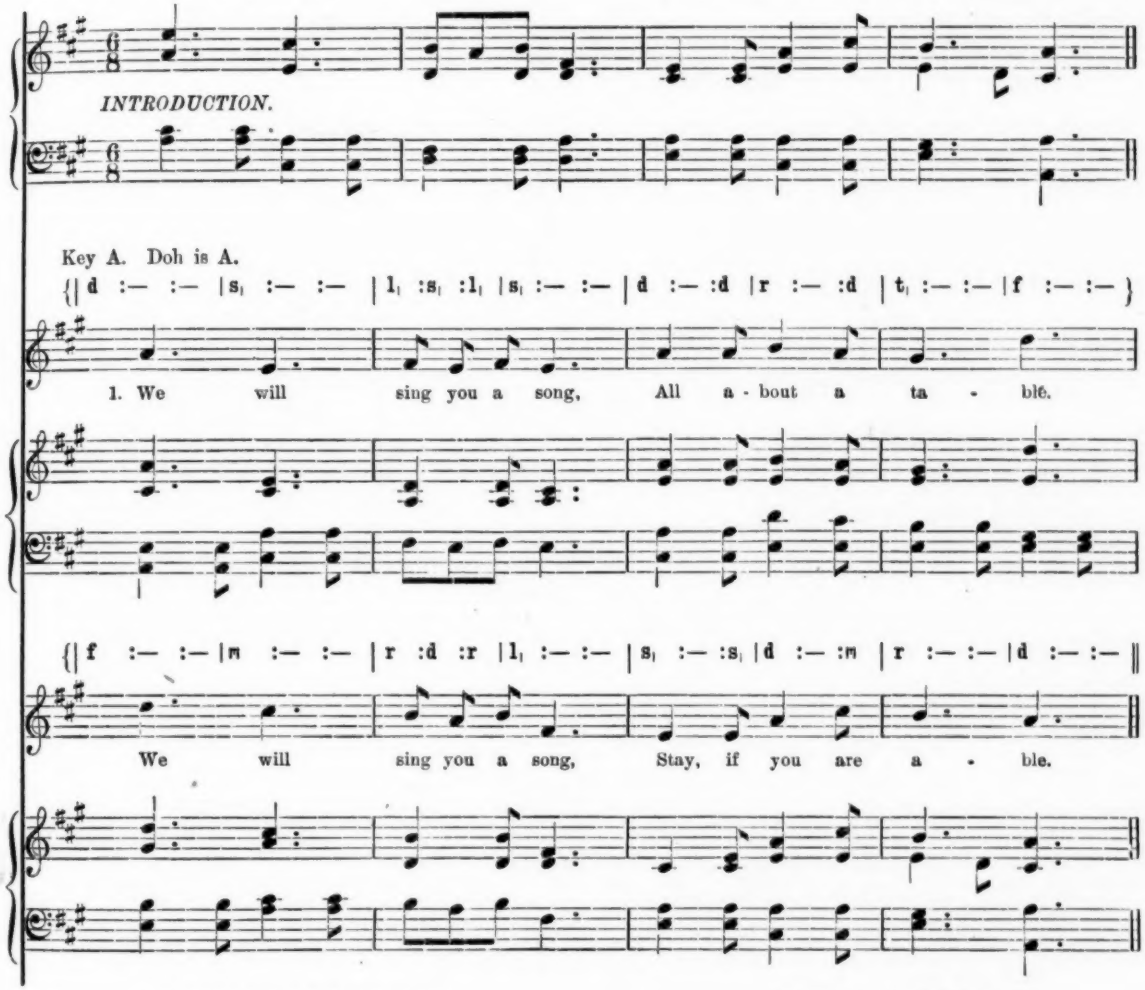
SISSIE TURLEY BUTLER.

THE TEACHING OF GEOGRAPHY.

AT a recent meeting of the Glasgow Branch of the Teachers' Guild, in combination with the Association of Women Graduates of Glasgow University, a most interesting paper on "The Teaching of Geography" was read by Professor Gregory, D.Sc., F.R.S., of Glasgow University. In the course of his remarks Professor Gregory said that Glasgow, owing to its foreign trade and its exceptionally instructive geographical position, offered special opportunities for the teaching of this important subject. Its special advantages were not utilised if geography were taught as an abstract subject, but they were a great help if the teaching proceeded from the "known" to the "unknown." Geography, if taught on the latter method, was one of the most useful subjects in elementary education, as it taught habits of observation, gave training in scientific methods without the use of our familiar technical terms, spread a sound knowledge of the world at large, and excited a sympathetic interest in it. The lecturer advocated beginning the teaching of geography in infant classes, with simple stories and such kindergarten work as using toy bricks to show the nature of plans and scale. The formal elementary teaching, he said, should begin at about the age of seven, at which age he thought it quite useless to teach the shape of the earth or its movements. He recommended that the teaching should begin with the drawing of simple plans and maps of the school grounds, the observation of shadows to show the movements of the sun, and of the weather, and simple experiments to demonstrate evaporation. The meaning of the chief geographical terms should be taught by the study of reference to the nearest examples that could be personally visited, and most of the terms could be illustrated from the Glasgow parks, or those of any other large city. Those which could not be seen and mapped from actual examples should be shown by models in a sand tray. The work of this first grade of geographical teaching should be to train habits of observation, to show how observation could be recorded on maps, and to show the nature of geographical units such as peninsulas and lakes. The work in the next grade should proceed gradually from the school, by inferences from the nearest river, or, failing such, from a road or railway to the world outside the pupil's range of observation. The structure of any country should be explained by showing that it was composed of a number of earth-forms. Topographical geography should be taught in the third grade, when the student would be able to understand the nature of the chief geographical processes. It was admitted that such a course was not that at present officially recommended in Scotland; but the lecturer thought that it was only by using such methods that geography could ever take its proper place in the work of elementary education.

THE KITCHEN TABLE.

ACTION SONG OR GAME.

Words and Melody by SISSIE TURLEY BUTLER. *Arranged for the Piano by* LILLIE TURLEY.

INTRODUCTION.
Key A. Doh is A.
{| d :— :— | s, :— :— | l, :s, :l, | s, :— :— | d :— :d | r :— :d | t, :— :— | f :— :— }
1. We will sing you a song, All a - bout a ta - ble.
{| f :— :— | m :— :— | r :d :r | l, :— :— | s, :— :s, | d :— :m | r :— :— | d :— :— ||
We will sing you a song, Stay, if you are a - ble.

2. Trees! trees! look at the trees,
Swing arms. All the branches swinging.
Trees! trees! look at the trees,
Where the birds are singing.

3. Woodman comes with his axe,
Where the birds are calling.
Pretend to chop. Woodman comes with his axe,
See, the trees are falling.

4. Sawyer comes with his saw,
Where the trees are lying.
Pretend to saw. Sawyer comes with his saw,
Cuts the planks for buying.

5. In the carpenter's shop,
Pretend to work at lathe. Mr. Brown is humming.
In the carpenter's shop,
Table-legs are coming.

6. Now the tables are made,
Move hands to show smooth surface. Smooth and white and steady.
Now the tables are laid,
And the dinner's ready.

Instructions for Game.—Children stand in a circle, with six children inside to represent trees: these fall after 3rd verse, and rise again after the 4th. In 5th verse the children move right foot up and down to work the treadle of lathe, and, at the same time, bend slightly forward and pretend to hold a sharp tool which cuts the turning table-leg. In 6th verse two children stand facing each other and join hands. Three children from the ring run to the three tables so formed, and lay the cloth for dinner by putting a duster or pinafore over the joined hands.

OUR TUTORIAL SECTION

OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE.

BY ARTHUR T. FLUX,

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SCHOLARSHIP COURSE—PART II 1906.

Second Month—February.

Work to be Prepared.

I. *Composition.*—Write one or two essays of about 40 lines each week. Always make out a short analysis before commencing to write, and clothe your ideas in the best language at your command. Suitable topics for essays:—

(*a*) The advantages and disadvantages of being a member of a large family.

(*b*) "The English take their pleasures sadly."
(These subjects were set at Christmas.)

(*c*) How is a General Election conducted? What does it exactly mean?

(*d*) Free Trade and Protection.

(*e*) A winter landscape.

(*f*) Work.

(*g*) Benefits of sleep.

The following notes may be of assistance:—

(*a*) The advantages of being a member of a large family are probably more numerous than the disadvantages. The inevitable tendency is to spoil an only child, to grant every desire, to satisfy every whim. Even if this is not done, there is a probability of the child becoming selfish. In a large family there is little of this. Pleasures and privileges have to be shared, unselfishness is inculcated, corners are rubbed off and character developed. Receiving only a part of the parental control, the child early learns to rely more on his own resources.

(*b*) The old French writer made a mistake when he penned these words, a mistake which any one might make who did not understand the English character. There is a national stoicism and reserve in the Anglo-Saxon which is incomprehensible to the impetuous races of warmer climes. With them a slight joy is witnessed by extravagant gestures and outward signs, and slight grief reduces them to the depth of despair. In both cases not only the individual but also his friends share in the emotion, and it is strange to say, "We have piped unto you and ye have not danced, we have mourned unto you and ye have not lamented." The Anglo-Saxon prides himself on controlling his feelings, at least as shown by outward demonstration. He feels them as acutely—probably more so—than his volatile neighbour, but he is master of himself. Hence a Frenchman makes the mistake when he sees nothing to indicate pleasure of supposing that none is felt. *Autres pays, autres mœurs.* When England was suffering from the terrible news received from the Cape at the time of the Boer War, a leading French paper sent over a special correspondent to describe the riots and scenes which, according to the imagination of our Gallic friend, were to be enacted. But beyond a rather more subdued talk, a rather more determined look, there was no national exhibition of perturbation, and the correspondent returned in despair.

(*c*) Few students should have any difficulty with this subject. Explain carefully the various stages—the dissolution of Parliament, the issue of writs, the arrangements for the campaign, the method of voting, etc.

(*d*) This is another question which is filling the nation's mind at the present time. At present we admit into England raw and manufactured goods with little or no import duty, whereas English goods are not admitted into foreign countries except after paying a considerable duty. Protectionists say, "If any countries tax imports from us, why should we not retaliate by taxing theirs? by this means we shall assist our manufacturers by partially excluding foreign competitors, increase wages and national prosperity." This, the Free Traders assert, is a false conclusion. Such a step would not benefit the artisan classes at all. If trade improved it would mean higher dividends to the shareholders in manufacturing companies but not to the workers, and at the same time by placing an import duty on food stuffs you would raise the price of bread and other articles which are necessary for life, without raising the buying power. The subject is one bristling with difficulties. Whether England would gain or lose could only be ascertained by actual test.

(*e*) This subject affords an exercise in word painting. Imagine any scene you like, and describe it as graphically as possible. Read Cowper's "Winter Morning Walk" as an example of how the thing may be described.

(*f*) There is no disgrace or hardship in work. It is the natural concomitant of life. "If any man will not work, neither let him eat." It is part of the destiny of mankind—a fact which all great writers and thinkers have appreciated. "For suffering and enduring there is no remedy but striving and living," says Carlyle; and again, "Genuine work alone, what thou workest faithfully, that is eternal;" and again, "Our grand business is not to see what lies dimly at a distance, but to *do* what lies close at hand." "Blessed is he who has found his work, let him ask no other blessedness." "Do the work that's nearest, though 'tis hard at whiles," says Kingsley. The student can undoubtedly recall many more similar expressions. A man who does nothing does not live, he exists.

(*g*) More necessary to life than work is sleep. All the time we are awake or conscious the brain is active. It is the central office into which messages are continually pouring through the five gateways. No one can deal completely with each one received—the idle man deals with as few as possible, the busy man works hard all day trying to cope with the rush until the brain is fatigued and demands a complete rest. After a period of unconsciousness it is ready and anxious to start again. Poets have lavished all their highest fancies in describing sleep. "Tired Nature's sweet restorer, balmy sleep."

II. *English Language and Literature.*—The following is the paper set at Christmas, which will give an idea of the scope and style required:—

SECTION I.

(1) Analyse one of the following passages, and parse the words in italics:—

(*a*) "*These* rugged wintry days I *scarce could* bear,
Did I not know that in the early spring,
When wild *March* winds upon their errands sing,
Thou wouldst return, *bursting* on this still air."

(*b*) The French *are beginning* to complain that, though they are being fed upon fine phrases, the action of *Germany* has not *corresponded* with her words. To suppose, however, that the German Government entertains any of the designs *attributed* to it in certain quarters appears to us absurd.

(2) Construct sentences containing five of the following phrases, so as to show clearly their meaning and use:—

(*a*) To exonerate from blame.

(*b*) A baseless assumption.

(*c*) The stress of poverty.

(*d*) Maturity of mind.

(*e*) The principle of toleration.

(*f*) Systematic observation of details.

(*g*) To sully an unstained reputation.

(3) "Grammar in English is now determined by the relations of words, not by their forms." Explain the meaning of the

statement, and show its truth in the case of the following words:—*that, but, enough.*

SECTION II.

(4) Explain carefully, with reference where necessary to the context, one of the following passages from Shakespere, and one of the passages from Bacon:—

(*a*) "Friendship is constant . . .
. . . faith melted into blood."

(*b*) "No, no! 'tis all men's office . . .
My griefs cry louder than advertisement."

(*c*) "It follows then the cat and . . .
The advised head defends itself at home."

(*d*) "'Tis positive against all exceptions, lands
. . . .
Took stand for idle speculation."

Bacon.

(*a*) "One of the Fathers in great severity . . . such as we spake of before."

(*b*) "In many of these alleys . . . lest they deceive the trees."

(5) Explain and illustrate the meaning of four of the following sayings:—

(*a*) The most tolerable sort of revenge is for those wrongs which there is no law to remedy.

(*b*) Time is the greatest innovator.

(*c*) A place showeth the man.

(*d*) The most ordinary cause of a single life is liberty.

(*e*) *Abeunt studia in mores.*

(6) What views on the place and duties of a king are to be found in *Henry V.*?

SECTION III.

(7) In what connection are the following places mentioned in *David Copperfield:* Yarmouth, Dover, Canterbury, Australia, Highgate?

(8) Briefly describe the principal characteristics of a typical moss-trooper like William of Deloraine. Illustrate your answer by reference to incidents in the poem.

(9) What have you gathered from *The Talisman* itself as to the Order of Templars? What part does their Master play in the story?

The student will observe from the above that much more stress is laid on the literary side of the subject than the grammatical. A thorough knowledge of the text-books is essential, and that knowledge obtained by careful and thoughtful reading and not by cramming notes.

III. *Geography.*—Continue revision by means of *Test Questions in Geography* (Meiklejohn and Holden). In addition it would be well to look up the physical and mathematical sides of the subject. The questions set in the examination are prompted in many cases by the Suggestions to Teachers on the teaching of the subject. The following are the questions (five questions to be answered, three in Section A and two in Section B):—

A.

1. Enumerate the various signs used in Ordnance Survey maps. Draw a sketch map of any district with which you are specially familiar, using those signs where necessary.

2. Enumerate the chief industries of Ireland, and explain how far they are due to geographical causes.

3. "In England the main line of the railways follows the directions of the old Roman Roads." Discuss this statement generally and treat of one case in detail.

4. Enumerate and describe the position of the British possessions and protectorates in Africa (exclude the islands).

5. Describe the exact position of the following places, and state their commercial importance: Canton, New Orleans, Kurachi, Sydney, Montreal.

6. Describe the nature and uses of each of the following, and specify the districts in which each is found: sago, amber, petroleum, jute, flax.

7. Give the exact position of Glamorganshire, specifying its approximate size, its chief industries, and the centres in which these industries are respectively carried on.

B.

8. What are "tides"? How are they caused? Explain the terms "spring" and "neap" tides, and show by means of diagrams the action of the sun and moon in causing them.

9. State roughly the limits within which the trade winds prevail, and their general direction. State where and at what times of the year the south-west monsoons prevail.

10. Discuss the uses (*a*) climatic, (*b*) political, (*c*) commercial, of mountains, being careful to give examples to illustrate your answers.

11. Define the terms: Equator, meridian, parallel of latitude. How many degrees of latitude correspond to an hour of time? What time is it at New York (3000 miles west of London) when it is noon in London?

12. Describe some useful aids which are available in making lessons in geography interesting and attractive.

13. What is the value of learning to draw maps from memory? Explain what points you would observe in teaching children to *draw* a map of England and Wales.

Notes on above.—(1) Get an ordnance map and study it. Note particularly the hachures or shading and the contour lines.

(2) Linen, and because climate suited flax; Dairy farming—rich pastures due to climate; Fishing from the shallow waters, etc.

(3) A question that requires thought. The Roman roads ran as directly as possible between London and the chief provincial stations. The stations are now our old and important towns, *e.g.* Colchester, York, Chester, etc., and the railways naturally following the most direct route approximate to the roads. This statement is not so applicable in cases where the roads did not run to London—*e.g.* The Fosseway.

(4) (5) (6) are text-book questions.

(8) (9) can be readily answered from any physical geography.

(10) (*a*) Climatic: Shelter from cold winds. *e.g.* Maritime Alps, or warm winds, *e.g.* Yablonoi and Stanovoi Mountains, Himalayas (Thibet). By affecting slope to or from the sun affects climate largely.

(*b*) Political: Form a natural barrier and divide nations, *e.g.* Pyrenees, Himalayas, etc.

(*c*) Commercial: Prevent ready commerce, etc.

(11) Since the earth turns round once in twenty-four hours and there are 360 degrees, 15 degrees of longitude make a difference of an hour. In finding the time at New York, many students would probably say 70 miles make a degree, so that New York is $\frac{3600}{70}$ degrees west. This is incorrect. The value of a degree of longitude varies with the latitude; at the Equator it is roughly 70 miles, at the Pole 0. In the latitude of London it is about 43 miles only. New York is 74° west or roughly 5 hours later. Therefore when it is noon here it is seven o'clock in the morning there.

(12) Drawing maps from memory is the only way of fixing definitely in the mind the shape and position of countries and places.

IV. *History.*—Revise any weak points. The following is the paper recently set.

I.

(1) Give the modern names of Camolodunum, Deva, Eboracum, Verulamium, Venta Belgarum, with notes on their importance, and describe as accurately as possible the positions of Silchester, Watling Street, High Cross, and the walls of Hadrian and Agricola.

(2) Narrate shortly the progress of Christianity in Britain from the landing of Augustus to the death of Dunstan, making special reference to Penda of Mercia, Aidan, Synod of Whitby, Theodore, and Dunstan. How did Christianity affect the condition of the more helpless of the Anglo-Saxons?

(3) Point out how the Roman, Saxon, and Norman conquests differed in character. Describe the events of the year 1066 from the arrival in England of Hardrada to the Battle of Hastings. Do *not* describe the battle.

(4) Draw sketch map to show the Danelagh. Describe second invasion of Danes and explain why they were successful.

II.

(5) Describe the differences between Saxon and Norman armies, equipments, and tactics at Hastings, and between English and French at Crecy and Agincourt. Give a clear account of any *one* of these battles *or* of the battle of Bannockburn.

(6) "Stephen's reign was a period at which for once the feudal principle got its own way in England; it proved the wisdom of the Conqueror and his sons in repressing that principle, and it forced on the nation and its rulers the reforms by which in the succeeding reigns the recurrence of such a result was made impossible." Explain and illustrate each of the above statements.

(7) The plague of 1349 produced some marked social changes. Mention some of the latter, and compare the troubles of 1349 with those of 1549.

(8) Narrate clearly, with a sketch map, the campaign of Henry V. which ended at Agincourt. Describe a characteristic mediæval siege—*e.g.*, Calais or Rouen.

(9) What were the principles upon which Elizabeth dealt with religious difficulties throughout her reign? State what you know of the Jesuits and the Puritans.

Explain Elizabeth's long detention of Mary Queen of Scots, her reluctance to order her execution, and her final consent.

(10) Give a distinct and fairly detailed account of the progress of the Armada from the time it was sighted until it reached Spain again, illustrating your answer by a sketch-map.

III. (Special Welsh Questions.)

IV.

(11) Examine the conditions under which Henry VII. began his reign, and compare them with those at the accession of Elizabeth.

His reign is called the "Age of Beginnings." Name these beginnings, and trace the development of any one of them.

(12) How do you account, first, for the uncontrolled despotism of the Crown under Henry VIII., and, secondly, for the fact that such despotism did not continue after his death? Describe Thomas Cromwell's reign of terror, and account for his sudden downfall.

(13) The monasteries performed so many functions in English life that their sudden destruction caused widespread confusion and trouble. Discuss both parts of this statement. How far is it true to say that England was Protestant in the reign of Edward VI., and Catholic in that of Mary?

(14) What were the causes of quarrel between England and Scotland in the reign of Henry VIII. Narrate the circumstances leading to the battle of Pinkiecleugh, and explain carefully what is meant by the following remark, "Somerset ruined Henry's plan with regard to Scotland."

Notes.—This was an excellent paper for the thoughtful student, but hopeless for one who had merely crammed facts and dates. In nearly every question something more is required than is to be found in an ordinary text-book — namely, the ability to connect cause and effect, and to look at events from a proper historical standpoint.

(1) Camalodunum is Colchester: Deva, Chester; Eboracum, York; Verulamium, St. Albans; Venta Belgarum, Winchester; Silchester in North Hants, the junction of the Roman Road from London to Winchester with that from Cirencester; Watling Street, main road from Dover to Chester, *via* London High Cross.

Hadrian's Wall—between Tyne and Solway.

Agricola's Wall—between Firths of Forth and Clyde.

(2) The introduction of Christianity brought with it the first organised agency for the relief of the poor and distressed.

(3) The Romans came to conquer and hold as a subject province—to draw revenue.

The Saxons' conquest was one of gradual settlement, and displacement of the aborigines—a change of home.

The Norman Conquest—a military expedition to conquer and possess, but not to exterminate.

(6) Under the feudal system each great baron was a separate ruler—a little king to himself, unless, as in the case of the Conqueror, the overlord was strong enough to hold his barons in check. Stephen, relying on their support, could not oppose their wishes: hence the disorders. The reforms produced—*e.g.*, scutage, inquest of sheriffs, assize of arms, etc.—rendered it impossible for such a state of affairs to occur again.

(9) Elizabeth was tolerant. Though laws were passed against Catholics, they were not enforced except in cases of flagrant opposition or plotting. The Jesuits, members of the Order of Jesus founded by Ignatius Loyola, were at first zealous missionaries, carrying the Gospel into every country. As such they are worthy of admiration; but when, at the Reformation, they commenced intriguing in political matters, they became an object of hatred and suspicion to Protestants and eventually to Catholics themselves.

[The other questions will be dealt with in the Notes on the Special Period.]

NOTES ON THE SPECIAL PERIOD.

(9) The foreign policy of Henry VIII. (as directed by Wolsey) was to hold the balance of power between the great rival continental powers of France and Spain. The Holy League (Spain, England, Pope, and Venice) was formed against France in 1511. When the latter was beaten in 1513 an alliance between England and France was formed. In 1518 a confederacy of England, France, and Spain was formed, and Henry was arbiter between the two. As a result of Conference at Canterbury with Charles V. and at Field of the Cloth of Gold with Francis, England allied itself with Spain and attacked France. Wolsey hoped by the favour of Spain to obtain the Papacy, and his fall was partly brought about by the alliance of France and Spain at the Peace of Cambrai, 1529.

(10) *What was the Reformation?* The Reformation was an attempt made to *reform* some of the abuses which had crept into the Church—no idea of separation was at first entertained.

The *causes* were—

(1) The great wealth of the Church excited envy.

(2) The corrupt lives of the clergy and the Papal Court disgusted thinking men.

(3) The Papal schism—when there were *two* Popes, each claiming to be the genuine successor of St. Peter—weakened the implicit belief in the Church.

(4) The Revival of Learning and the invention of printing enabled men to read for themselves and to discover at once that the teaching of Christ and the teaching of the Church were entirely incompatible.

History.—There had been attempts before to reform abuses.

The Albigenses rose into insurrection during the Pontificate of Innocent III., and were crushed by De Montfort.

The Lollards in England (founded by Wyclif) were crushed by merciless persecution.

John Huss had raised his voice against corruption and was killed. Savonarola in Florence met with the same fate.

A strong man was needed to lead any movement into success, and this man was found in Luther, who attacked the sale of Indulgences in Wittenberg. In 1520 he was excommunicated, and summoned to appear before the Diet of Worms in 1521. His views were supported by some of the princes of Northern Germany. In 1529 the Reformers were first called Protestants, from their protesting against the decision of the Diet of Spires. In 1530 they presented their famous Confession of Faith at Augsburg. A severe edict was issued against them, and, in self-defence, they formed the League of Smalkald in 1530, and thus they united the Protestant States into one body. Their ideas spread rapidly amongst the Teutonic people. In Germany the struggle produced the Thirty Years' War, in France the persecution of the Huguenots.

Reformation in England.—Henry was not a reformer. He had separated from the Church in 1534 to gratify a coarse passion; the suppression of the monasteries had humbled the clergy, so that he became Supreme Head of the Church with no opposition. But he denied none of the doctrines of the Romish Church, and burnt Protestants and Catholics at the same stake, the former for their heresy, the latter for their orthodoxy. The Articles of 1536 were issued "to settle all differences." It was not till the reigns of Edward VI. and Elizabeth that the Protestant religion was firmly established.

Points on which the Reformers differed from the Church:—

(1) They denied the doctrine of Transubstantiation.

(2) They desired communion of both kinds, *e.g.*, the bread and the wine.

(3) They disbelieved in auricular confession, vows of chastity, masses for the dead, compulsory celibacy of the clergy.

(4) They objected to the extreme ceremonial of the Church—prayers for the saints, etc.

Publication of the Scriptures.—Before the Reformation there were two, if not three, versions of the Bible in English: (*a*) Wycliffe's, (*b*) a translation based on Wycliffe's but strongly tinged with Lollard opinion. It was not till the Reformation that a general demand for a good translation arose. The chief editions (based on the Septuagint) were:—

(*a*) Tyndale's (1530 and onwards) New Testament, then Pentateuch, and so on till all the Bible appeared in separate portions.

(*b*) Miles Coverdale, with the aid of Tyndale, translated and printed a new version at Zurich and published it at Hamburg, 1535.

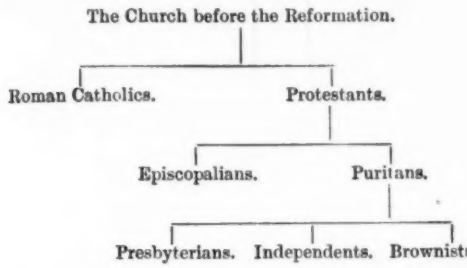
(*c*) Matthew's Bible (supposed to be the work of Rogers). This was reprinted in 1528 as the Great or Cranmer's Bible. From this the Prayer-book version of the Psalms was taken. Tyndale's Bible contained side-notes and comments which Cranmer omitted.

(*d*) Various other versions, among which was Taverner's.

(*e*) The Authorised Version of 1611.

Protestant Sects.—Although the Protestants differed from the Catholic Church, they were far from united in themselves.

Students must be careful not to confuse the terms employed. The following table shows the chief divisions:—



The Episcopalians believed in the Established Church and government by Bishops: the Puritans did not. The Presbyterians acknowledged Church rule by Elders: Independents thought every Church should rule itself. There were many other sects, but all of them come under the term of "Puritan."

(11) *What were the Effects of the Dissolution of the Monasteries?*

The monasteries were, through the Middle Ages, the helpers and almoners of the poor. The tenants of abbey lands were well treated, hospitality to the wayfarer or needy was rarely refused. So efficiently was the work done that there was really no "pauper" question previous to 1524. When the monks were dispossessed, their lands were given over to needy courtiers, who wanted to make as much as possible of their possessions. No help was given to the needy, farmer tenants had grasping masters, and in many cases the lands which had been tilled were turned into sheep farms, for wool paid better than corn. There were thus many men thrown out of work just at the time when help was taken away. The common lands were many of them enclosed, thus depriving cottagers of the free pasturage which had been their right since Saxon times.

The results were—(*a*) a large number of unemployed, (*b*) acute distress, (*c*) smouldering discontent at the changes which produced this. Hence, Pilgrimage of Grace, Ket's rebellion, etc.

V. *Algebra.*—Work the following paper set at Christmas.

(1) In a class there are l children 8 years and 2 months old, m children 8 years and x months old, and n children 7 years and 6 months old. What is the average age?

(2) Simplify—(*a*) $\dfrac{a^2b^2}{a^2-b^2}\left(1+\dfrac{a}{b}\right)\left(\dfrac{a}{b}-1\right)$

(*b*) $\dfrac{a^2-a-6}{a^3+4a^2+5a+2}$.

(3) Prove that $\dfrac{a(b^3-c^3)+b(c^3-a^3)+c(a^3-b^3)}{(a-b)(b-c)(c-a)}=a+b+c$.

(4) Solve (*a*) $\dfrac{3}{x}-\dfrac{4}{y}=20,$

$\dfrac{2}{x}+\dfrac{2}{y}=25.$

(*b*) $\dfrac{2x-\frac{1}{3}}{8x-\frac{1}{4}}=\dfrac{x-\frac{1}{3}}{4x-\frac{1}{4}}$.

(*c*) $(x+2)(x+3)=20.$

(5) A grocer blends teas whose costs are 1s. 8d. and 1s. 9d respectively per pound. If he sells 450 lbs. of the blended tea at 1s. 10d. per lb. he gains £2, 18s. 4d. In what proportion did he mix the teas?

(6) The L.C.M. of 2 numbers is 1547, and their G.C.M. is 17. Find their product, being careful to explain fully the reasons for your procedure.

(7) The following table gives the square root (=S) of certain numbers (=N):—

S	1	2	3	4	5	6	7	8
N	1	4	9	16	25	36	49	64

Plot the graph on squared paper, showing the relation between N and S, and hence find approximately the square roots of 34.

Accuracy is of great importance.

(A very easy paper, if factors are well known.)

For Women.—

(1) How long will two pipes together take to fill a cistern which they can fill separately in x and y minutes.

(2) Simplify $\dfrac{a}{(a-b)(a-c)}+\dfrac{b}{(b-c)(b-a)}+\dfrac{c}{(c-a)(c-b)}$.

(3) Solve (*a*) $\dfrac{10-x}{2}-\dfrac{x-3}{4}=\dfrac{x-1}{4}-\dfrac{13-x}{6}$.

(*b*) $(a+b)(x-a-b)=(a-b)(x-a+b)$.

(4) A man has 5 hours to spare, and he spends the time by going out in a coach and back in a motor-car, travelling respectively 10 and 15 miles an hour. How far did he go out?

VI. *Euclid.*—Revise Book I. and work 6 deductions per week.

Work the following:—

(*a*) In bisecting an angle must the equilateral triangle in your construction be on the side of its base remote from the given angle? Give reasons.

(*b*) The sides AB, BC, CD, DA of a quadrilateral measure 3, 5, 9, 8 inches respectively. Show that the angle BAD is greater than the angle BCD.

(*c*) The base BC of a triangle ABC is divided at F and H. It is found that each of the three parts BF, FH, HC measures 3 inches. EHF is an equilateral triangle. Show that ABC is an equilateral triangle if EC and EB bisect the angles B and C.

(*d*) The bisectors AEF, BEG, CKG, DKF of the interior angles of a quadrilateral ABCD form another quadrilateral EFKG. Show that the opposite angles of the latter are together equal to two right angles.

(*e*) Construct a triangle having two sides equal to two given lines and its area equal to that of a given triangle.

VII. *Elementary Science.*—Finish the chemistry and revise as much as possible of the work in Section I.

Answer the following:—

(1) State what would be observed on heating each of the following substances in a test tube:—

(*a*) Common washing soda.
(*b*) Potassium chlorate.
(*c*) Salt with sulphuric acid.

What test would you apply in each case in order to identify any gas issuing from the mouth of the test tube?

(2) Chlorine, in the form of bleaching powder, is often used as a disinfectant and bleaching agent. What property of the gas renders it useful for these purposes? Given two or three cylinders of chlorine, what experiments would you make to demonstrate its most important properties?

(3) Describe any experiments you have seen or made with the object of finding the equivalent of a metal. What do you understand by the term equivalent?

(4) A candle and phosphorus are burnt separately under bell jars standing over water. At the completion of the reaction and after the contents of the bell jars have cooled the water is seen to rise. Contrast the two results and explain any difference.

PUPIL TEACHERS' COURSE.

For Candidates' Examination, 1906.

Work to be Prepared.

1. *Reading and Repetition.*—Steady practice must be taken in these subjects, paying special attention to emphasis and modulation.

2. *English.*—

(i.) Learn 10 roots and meanings each week from the *Pupil Teachers' Note-Book.* This must not be neglected.

(ii.) Prepare answers to the following questions:—

(1) Analyse in tabular form—

"From every *clime* they *come*
To *see* thy *beauty* and to share thy joy
O *Sion!* an *assembly such as* earth
Saw *never*, such *as* heaven stoops down to see."

(2) Parse the words italicised.

(3) Paraphrase—

"Such tricks hath strong imagination
That, if it would but apprehend some joy,
It comprehends some bringer of that joy,
Or, in the night, imagining some fear,
How easy is a bush supposed a bear."

(4) Show by example the different uses which may be made in English of the words *what* and *that*.

(5) Give the meanings of the prefixes *extra*, *ob*, *be*, *for*, *ante*. What do the suffixes *ster*, *ish*, *ant*, and *let* denote respectively? Give an example in each case.

(6) Explain the terms subject and object with reference to a complete sentence. Write down a simple sentence containing a subject and an object. What kind of verb must be used in each case.

(7) Comment on the syntax of the following sentences:—

(*a*) The man has five daughters. Either of them can play beautifully.
(*b*) She don't deserve anything.
(*c*) He is very fond of calves' head.
(*d*) These kind of children are difficult to manage.
(*e*) I little thought it was him.

(8) What is a conjunction? Give six sentences containing correlative conjunctions.

(iii.) *Marmion*. The next ten stanzas of Canto IV.

(iv.) Composition. Write one or two essays on such subjects as—

(1) The Post-Office.
(2) A miner's life.
(3) The advantages of a good character.
(4) Virtue is its own reward.
(5) Insect life.
(6) A flower show.
(7) War.

Think over the subject well before commencing to work, and, if necessary, read up the subject.

Always prepare an analysis before commencing to write. Revise carefully.

The subjects demand little assistance. (4) The meaning is that the enjoyment and peace of mind arising from doing what is right is ample reward for so doing. (5) Point out the usual stages in the life of an insect: egg, larva, chrysalis, etc. Make a strong point of their use to man as scavengers.

3. *History.*—Henry VII. and Henry VIII.

Two very important reigns. Read up the notes given this month and last month in the Scholarship Course. Prepare lives of the chief men.

4. *Geography.*—Russian Asia.

Draw a sketch map, insert all names to be remembered, and repeat until you can produce it accurately from memory. Note the course of the Trans-Caspian and the Trans-Siberian Railways.

5. *Arithmetic.—Stocks and Shares.*

There should be no difficulty with these sums if the candidate will clearly understand the difference between Stock and Money. If this is clearly grasped, the sums are merely exercises in proportion by method of unity.

Work as many examples as you can from Christian and Collar.

6. *Algebra.*—General exercises in problems leading to simple equations.

7. *Music.*—Answer the following questions:—

(1) Re-write the following: (*a*) in the "better method"; (*b*) in the imperfect method.

(*a*) f d' ta l m l, l s ta r' d' l s f
(*b*) m d r 'd t, d l, s, t, r 'd' m s f m

(2) If the first note of each of the following passages is regarded as *me*, what will the others become?

(*a*) t r fe s l fe l t m fe s
(*b*) l f ta s d' l ta r d ta, l

(3) When **s** becomes **d**, what is the distinguishing note of the new key? If the first note of the following passage be taken as *me*, what will the others become?

t l fe s l m fe s d' t

8. *Science.—Acids and Alkalies.*

Examination and preparation of sulphuric, hydrochloric, and nitric acids.

9. *Spelling* 100 words from *Words Commonly Misspelt*.

10. *Penmanship.*—Write a page daily in the *Practical Teacher Copy-Book*.

Test Questions.

1. Write as specimen of copy-setting:—

Large Hand.—Gyroscope.

The Great Wall of China was built to keep out the Tartars.

2. Explain clearly the causes of the Wars of the Roses. Draw a genealogical table to show the rival claimants.

3. What were Benevolences? Describe the events which led to the Battle of Bosworth.

4. What are the Treaty ports of China? What are the chief goods imported and exported?

5. Japan is called the "Britain of the East." Explain why this is very appropriate.

6. Work the following:—

(1.) Taking 1600 metres as equal to a mile, how many square metres are there in an acre and a quarter? *Ans.* 5000.

(2.) If $\frac{1}{2}$ of a sheep be worth £$\frac{3}{4}$, and $\frac{3}{4}$ of a sheep be worth $\frac{1}{14}$ of an ox, how much must be given for 100 oxen? *Ans.* £2000.

(3.) Two elephants and four horses can do a piece of work in 7½ hours, and a single elephant can do it all in 20 hours. How long will a single horse take in doing it? *Ans.* 100 hours.

(4.) A watch which loses 5 minutes a day is set right at 9 A.M.; find the true time when the watch indicates 2 P.M. on the following day. *Ans.* 6 min. 3 $\frac{13}{17}$ secs. past 2.

OUR CERTIFICATE COURSE FOR 1906.

BY GEORGE COLLAR, B.A., B.SC.,

Head-Master of Stockwell Pupil-Teacher School.

Test Questions on Last Month's Work.

Theory of Teaching.

1. In what ways does the teaching of Geography train (*a*) the observation, and (*b*) the reasoning powers of children?

2. What does Froebel denote by his "Means of Education"? Give a list of them.

English Literature.

1. Compare the characters of Sir Henry Lee and of Colonel Everett.

2. What were the circumstances that led Milton to write the *Areopagitica*?

English History.

1. Give an account of the Earl of Clarendon, and endeavour to estimate his influence on the politics of his time.

2. What circumstances make Shaftesbury a prominent figure in the reign of Charles II.?

3. What is the "Cabinet"? Trace the rise and progress of the system of governing by a Cabinet.

Geography.

1. Trace the great modern routes connecting the south with the north of Europe. What have they in common with the older routes?

2. Write a short account of Holland under the following heads:—(*a*) surface, (*b*) productions and industries, (*c*) character of the people, (*d*) government.

3. In what ways is the presence of lakes important to a river system? How would the river Danube be affected by the presence of a large lake midway along its course?

Arithmetic.

1. Show that the difference between True and Banker's Discount is equal to the interest on the True Discount for the same time and rate.

2. By how much does the compound interest of £6750, for three years at 3 per cent. exceed the simple interest on the same time and at the same rate?

Algebra.

1. What is the length of a race in which A beats B by 5 seconds and B beats C by 1 second, the average pace of A being ¼ yard per second greater than that of B, and that of B ¼ yard per second greater than that of C?

2. A certain number of two digits is equal to five times the sum of its digits; and if 9 be added to the number the digits are reversed. Find the number.

3. Find two numbers whose difference, sum, and product are as the numbers 1, 2, 3.

Geometry.

1. To a man standing on the edge of a river, the top of a tower on the opposite bank subtends an angle of 25° with a horizontal line from his eye to the tower. He walks backwards 40 feet, and the top of the tower now subtends an angle of 20°. Determine by drawing a figure what was the width of the river.

2. ABC is a triangle, and D the foot of the perpendicular from A to BC. Draw the figure, and indicate by any lines you deem necessary, and any explanation, how you could illustrate to a class that the three angles of a triangle are together equal to "a flat angle."

It is assumed that with your class you have a sheet of paper cut out in the shape of ABC.

Elementary Science.

1. Give a summary of the differences (*a*) between living and non-living matter, and (*b*) between animals and vegetables.

2. What are the distinguishing characteristics of the vertebrates? Contrast them in each of these respects with the invertebrates.

Notes and Syllabus for February.

English Composition.

Study the *Art of Writing English*, Chapters XIX.–XXI., or *Senior Composition*, Chapters X. to the end: the subjects for essays should be looked through, but only a few attempted.

Prepare essays on the following:—

1. Vegetarianism.
2. The co-education of the sexes.
3. "Consistency is the virtue of fools."

English Literature.

Make a detailed study of Milton's *Areopagitica*.

In the sonnet to the Lady Margaret Ley, Milton says that her father lived

> "Till the sad breaking of that Parliament
> Broke him as that dishonest victory
> At Chæronea, fatal to liberty,
> Killed with report that old man eloquent."

The "old man eloquent" here referred to is Isocrates, the Athenian orator, who at the age of ninety-six starved himself on hearing the report of the victory of the Macedonian king, Philip, over the Greek states. Isocrates was the teacher of Demosthenes, the world's greatest orator, and a writer whose speeches were very much admired by Milton. One of these speeches, called the Areopagitici oration, urged the court of the Areopagus to adopt certain reforms, and it served as the model on which Milton drew up his tractate on the subject of the liberty of the press. In this he voiced his own feelings, and the feelings of Englishmen in general, in favour of that free exchange of thought which is one of the essential conditions in the progress of a nation.

In the matter of restraining the press the Government was acting quite illegally, for, as Selden said in the House of Commons in 1628, "There is no law to prevent the printing of any books in England; only a decree of the Star Chamber." In order to put an end to the opposition that might arise if people were allowed to give their opinions to others through the press, the Roman Catholic Church established an ecclesiastical superintendence over printing, and in 1515, Leo X. issued a bull charging all bishops and inquisitors to examine all books before printing, and to put down all heretical teaching. After the Reformation the same practice was continued, and Elizabeth delegated the censorship to the Archbishop of Canterbury and the Bishop of London, and prohibited the establishment of any printing press except at London, Oxford, and Cambridge, and even there the presses were limited in number. Under Charles I., in 1637, a very stringent decree was issued, requiring all books of Divinity, Physic, Philosophy, and Poetry to be licensed by the Archbishop of Canterbury or the Bishop of London, and among the books that were refused a license was Foxe's *Book of Martyrs*. When the Long Parliament abolished the Court of Star Chamber it set up a "Committee of Examinations" to carry on the censorship formerly exercised by that Court, and on June 14, 1643, the Lords and Commons published an ordinance "for the regulating of printing, and for suppressing the great late abuses and frequent disorders in printing many false, scandalous, seditious, libellous, and unlicensed pamphlets, to the great defamation of religion and government." It is rather difficult to trace the effect of Milton's treatise, for the ordinance was not withdrawn, and at the Restoration not only was the method continued, but the censorship was legalised by the passing of an Act of Parliament in 1662. In 1694 this Act was repealed, and for over two hundred years we have enjoyed a free press in England, and for this we are indebted to a considerable, though indefinite, extent to Milton's advocacy.

Theory of Teaching.

This month should be specially devoted to the study of the life and work of Pestalozzi. Dr. Hayward's little book is strongly recommended. The student should also procure Quick's *Educational Reformers*, and after he has studied the section on Pestalozzi, he should carefully read the others. Pestalozzi may very appropriately be called the apostle of the elementary school. He is a follower of J. J. Rousseau, inasmuch as he goes to Nature in his teaching; but Rousseau, like Locke, concerns himself with one pupil only, and that a child in easy circumstances, while Pestalozzi deals with numbers and with children of the poor. Numerous writers have borne witness to the greatness of Pestalozzi's work. Even Herbart, the great philosopher of pedagogy, who visited Pestalozzi and saw him at work in his school at Burgdorf, recognises his great indebtedness to him. Quick calls him the most celebrated of educational reformers; and Compayré says: "I do not believe that the history of education can present us with another figure so original, a physiognomy so touching, or a similar example of passionate devotion to the education of the people." He was not an abstract writer on matters of education like Rousseau, but a man of action, one who devoted his life and means to the education of his fellow-creatures in the hope of thereby making them better and happier. On this account his influence has been most profound and most penetrating, and his memory is tenderly revered in Zurich and other places where education is not looked upon as a monopoly of the rich, but as a means of promoting goodwill and fellowship among all classes, and of enabling each man to do his duty in that state of life into which it pleases God to call him.

Pestalozzi was the son of a doctor at Zurich, who died when his son was but six years old. He was therefore brought up under the loving care of his mother, and from this circumstance we can perhaps trace that tenderness which was, as it were, part of his nature, and also that lack of experience and ability in dealing with business matters. In 1769, being then twenty-three, Pestalozzi married Anna Schulthess, daughter of a confectioner of Zurich, and one year later his only son was born. The duty of educating his son led to the consideration of the best means of educating children in general. In 1774 he wrote some notes in his private Journal which contain in germ the leading principles of his pedagogy. He seems to hesitate between authority and liberty in education, but he was very definite on the point of developing the child's senses, making him see, making him hear, and grasping things before words. He considered it as an obstacle in arriving at the truth to know words which did not correspond to exact ideas. Above all things, he respected the natural gaiety of children. Later on he wrote: "Laughter is a gift of God. Let the child laugh; foster gaiety in him."

In 1775 Pestalozzi opened a school for beggar children at Neuhof, and by giving them his son as a playmate he not only showed the pupils that he wished them to regard him as a father, but showed that no real educational system can be consistent with caste and class distinctions. This school, or "asylum," was opened on the spot where Pestalozzi had bought

a small farm, and hoped to make a competency by farming; but he failed utterly, and, to external appearance, his educational work there was equally unsuccessful in spite of marvellous self-sacrifice, and in 1780 his establishment was closed. For the next eighteen years Pestalozzi remained at Neuhof, struggling against want and misery. During this time he was busy elaborating his ideas, and he published several books. The most successful of these was the first volume of *Leonard and Gertrude*, of which, however, the last three fell rather flat. Although he was despised by his neighbours, he was honoured abroad for his efforts in the cause of humanity. The Legislative Assembly decreed him the honour of French citizenship in 1792; and the same year, when he journeyed to Leipzig, he was welcomed by Goethe, Wieland, Klopstock, Herder, and others.

In 1798, after the political upheaval in Switzerland, he was invited by the Government to open an orphanage at Stans, where he had charge of from eighty to a hundred children. Circumstances were not favourable to the commencement of his work. He was sent by the victorious party to carry education into a district lately laid waste by fire and sword; moreover, he was a Protestant sent among Catholics.

The building at Stans was very poorly equipped, and Pestalozzi had to devote himself to all kinds of things, but he did so with such enthusiasm and tender devotion that he speedily made it a great success. At the end of six months, however, war broke out again, and the school was transformed into a military hospital. The consequent dispersal of his little flock, to whom he was so much attached, caused the master's health to give way, and he was obliged to seek rest among the mountains. He recovered, and after a few months was appointed an assistant master in a little school at Burgdorf. Here his work was so much approved that he was made head of the Burgdorf "Institute of Education." This was rather a mixed affair—partly school and partly college—and was established in the Château of Burgdorf; and it was not the elementary school that Pestalozzi so much loved, but he worked devotedly at it. His influence here was not so directly exercised on the children, but it was not less on that account, for it was exercised through some disciples and collaborators—Krusi, Buss, and Tobler, and, later on, Neef (who became a special teacher of the deaf and dumb), Barraud (who propagated the methods in France), and Schmid.

In 1804 political events led to the expulsion of the Institute from the Château of Burgdorf, which was used for municipal purposes and as a prison, and Pestalozzi was removed to Yverdon. There he was visited by numerous great and distinguished people who had heard of his work, among them being Madame de Staël, Froebel, and the Queen of Wurtemburg. Pestalozzi had been sent on a mission to Paris in 1802, but he did not find much favour with the rulers. Napoleon told him that he had no time to trouble about questions of A B C. Talleyrand, after hearing a lesson, said disdainfully, "It is too much for the people;" and Monge, the founder of the École Polytechnique, expressed himself in similar terms. No wonder that Pestalozzi formed a low opinion of Frenchmen.

But although Pestalozzi realised the importance of securing powerful friends to further his educational ideals, yet he was indefatigable in the labours he daily undertook to assure the success of the institute at Yverdon. The scholars rose at six, but Pestalozzi was always up before them, and watched them take their shower-bath in the courtyard. The day's work began with a conference of the whole school on some religious or moral topic. No lesson lasted longer than an hour, and recreations and walks in the neighbourhood were freely interspersed. Each pupil had a plot of garden ground to cultivate, and considerable attention was paid to manual work. Singing also occupied a considerable portion of the time.

Unfortunately Pestalozzi had great trouble with his staff. Being unable to direct special studies himself, he had called in the help of special teachers, who quarrelled among themselves and with their master, so that the last years at Yverdon were full of trouble. Two of these teachers left him, and set up rival schools in the same town, and soon the Cantonal authorities demanded the dismissal of Schmid, who was most loyal to Pestalozzi. At last, on 2nd March 1826, Pestalozzi left Yverdon and returned to his old home at Neuhof, whither his faithful friend Schmid accompanied him. After a few marks of recognition, and some further attacks from his enemies, he went to his rest on 17th February 1827.

Next month we propose to deal with his methods.

English History.

Study carefully the reign of George III.

Notice the strong position of this country when George III. came to the throne. The Seven Years' War was raging, and England was helping Frederick of Prussia, but on the Continent the English army did not achieve much; the Duke of Cumberland was obliged to retreat before the French and agree to the convention of Kloster Seven, and the attacks on Cherbourg and St. Malo were not very brilliant, although they helped Frederick by compelling the French to retain considerable forces in the north and west of France. The supremacy at sea was secured by the destruction of a fleet of French transports in the mouth of the Seine, by the defeat of the Toulon fleet at Algarve by Admiral Boscawen, and by Hawke's victory over a fleet of twenty-five French vessels near Quiberon. This made possible the success of British arms in India and Canada.

The Seven Years' War was concluded by the Treaty of Paris in 1763, which acknowledged a great increase in the British dominions — Gibraltar and Port Mahon were assured and Canada and Nova Scotia were ceded, as well as several important islands in the West Indies. Although the towns taken from the French in India were restored to her, yet the military exploits of Clive had established such a prestige for British arms that all hope of French dominion in India was gone. The career of Clive should be carefully studied, and the rise and progress of British rule in India must be taken as a special subject. Another subject deserving separate treatment is the American War of Independence; the causes which led to the war must be carefully studied, particularly the principle of representation going with taxation. The course of the war must be traced out on the map, and the student is strongly advised to read Sir E. Creasy's account of Saratoga (which was the crucial battle of the war) in the *Fifteen Decisive Battles of the World.*

The importance of naval supremacy was also well illustrated, for York Town might have been relieved had the British naval forces been superior, and Rodney's brilliant victory over De Grasse came too late.

The French Revolution should also be studied as a separate subject.

Geography.

Study the physical geography of North America.

Practise the outline so as to retain a correct idea of the general shape, notice the differences between the east and west coasts, the former much more indented than the latter, which, like all coasts which have mountain ranges near them, runs down rapidly into the deep sea. Do not imagine that the Rocky Mountains form one sharp ridge, but trace out the way in which valleys have been hollowed out from a comparatively broad mass of elevated land. In the east the watershed between the basin of the Mississippi and the Atlantic is formed by the Appalachian or Alleghany Mountains. The highest points reached are Mount St. Elias, 19,500 feet, in Alaska, and the Mexican volcanoes, Popocatepetl and Orizaba, each about 18,000 feet high.

The plains are important, but vary much in fertility. An immense area stretching between Quebec and Manitoba is composed of a hard rock called gneiss, with here and there a thin layer of soil on the surface. Then the district stretching to the west of this, as far as the Rocky Mountains, is a stretch of fertile land admirably suited for the growth of wheat. The extreme cold of the northern districts in general and the rocky nature of the north of British Columbia in particular render those parts unproductive. The provinces lying close to the St. Lawrence are very productive. In the United States the western half of the country lies almost entirely over 1000 feet above sea level; the eastern half is mainly below that limit.

In dealing with such an extensive area as North America, it is impossible to make very general statements, and the climate of any particular spot should be compared with that of places in Europe on corresponding latitudes. The direction of the prevailing winds is a very important factor, and with it we must take into account the fact that in North America the great mountain chain lies at right angles to the direction of the prevailing winds. The pleasant dry winds, called Chinook winds, that blow in winter at the eastern base of the Rockies should be noted. The climate on the whole is drier than in corresponding parts of the Old World, and in summer California frequently suffers from drought.

The river gorges or "cañons" of the Colorado should be noted; they are due to the character of the rocks forming the tablelands and to the absence of rain. The rivers wear out the channel through the plateaux, and the cliffs are left standing vertically on both sides because there is no rain to make them weather away.

ARITHMETIC.

Read again the chapter on Percentages, and study the two chapters on Profit and Loss.

The great difficulty in Profit and Loss arises from the custom of making incomplete statements. It is explained in the chapter on Percentages that a percentage is only another name for a vulgar fraction of which the denominator is 100. Hence it is really as absurd to talk of selling something at a profit of 5 per cent. as it would be to talk about paying 15, or $\frac{3}{4}$, for an article. The correct method is to say that the article was bought for 15 *shillings* or $\frac{3}{4}$ *of a pound*, etc., and that it was sold at a profit of 5 per cent. of *the cost price*. As we cannot add £5 and 7s. together and say they produce 12 pounds or shillings, so we cannot add or subtract percentages of *different* quantities. This confusion occurs in such sums as the following:—

A bought a horse for £40 and sold it to B at a gain of 10 per cent., B afterwards sold it to C at a gain of 5 per cent. How much did C pay for it? The student thinks that C paid 15 per cent. more than A did, because 10+5=15. But A gained 10 per cent. of his cost price, and B gained 5 per cent. of his own cost price, which was not the same as A's, and so the two cannot be added together. The problem should be worked in two steps: A sold the horse for $\frac{110}{100}$ of £40, *i.e.* £44. This was the cost price to B, who made a profit of 5 per cent. on £44, not on £40. Hence B sold it, and C bought it for $\frac{105}{100}$ of £44, *i.e.* for £46, 2s.

ALGEBRA.

Go to the end of Chapter XXIX. in Hall and Knight's *Elementary Algebra*.

GEOMETRY.

Take the various problems arising out of the construction of a circle—(1) radius given, (2) point or points on the circle given, (3) contact with a given straight line or circle, (4) contact with a given straight line at a given point. Also the construction of a rectilineal figure to a given scale or of a given area, and similar to a given figure. Construction of a square equal in area to a given polygon. A formal proof of the construction is not needed in these cases, but if the construction is not carried out on lines which are obviously sound, the candidates should write a few notes to explain the principles on which they have proceeded.

ELEMENTARY SCIENCE.

In considering the relation between the organs of different animals, we have to note whether they are *homologous* or *analogous* parts. Homology is a far deeper relation than analogy, and is applied to organs which have a similar development and origin, which is shown by their structure, especially by the arrangements of the parts of the skeleton; but analogy consists in the similarity of use between the organs considered. For example, the wing of a bird is homologous with the fore-leg of a dog, for if the skeletal structure be examined the correspondence in structure is at once evident, but it is only analogous with the wing of a fly, for although these two organs serve for the purpose of flight there is absolutely nothing in common between their structures. Homology may also be found between different organs in the same animals: thus the legs and arms of a man are homologous, so are the upper and lower sets of teeth; and, taking it into detail, the thumb is homologous with the great toe, and the fingers with the remaining toe. This kind of homology is called serial homology. The homology which exists between the organs of different creatures, which are used for widely different purposes, or even not used at all, is one of the strongest proofs that modern types of animals are descended from common ancestors, and while their general structure follows the same plan they have become modified to suit the special use to which they have been put. The whale lives in the water and is often erroneously called a fish, but the examination of the bones of its fore-limb shows the existence of a blade-bone to which is attached a thick, strong humerus, followed in turn by radius and ulna, and other bones corresponding with those of the human arm; but the whale's limb is used for swimming, and the human arm for grasping objects. On the same model are constructed the fore-leg of the horse, which is used for walking or running, the fore-leg of a cat which is used for walking and for seizing prey. In the case of serpents the limbs were not used for motion or for seizing prey and have quite disappeared, except in the case of pythons, which have rudimentary limbs, which never come through the skin. The modification of the type may occur in a variety of ways; we have seen that it consists of a shortening, widening, and strengthening in the case of the whale. In the bat, which, like the whale, is a mammal, the fingers are elongated to a very great extent, and covered with a skin which not only joins them, but extends right down the sides of the body to the tail. In birds, the wing has been developed by the lengthening of the humerus, and radius and ulna, *i.e.*, the bones of the arm and fore-arm: the finger bones are small and run together. These latter bones are also small in the case of quadrupeds that use their fore-limbs for walking, but the more they are used for grasping the longer they are. Lizards and frogs have fore-limbs very much like our own. One species of extinct flying lizard—the pterodactyle—had such an enormous extension of the fifth finger that the web spread out by it enabled the creature to fly, and led to its name, which signifies "wing-fingered."

In addition to the homology which we find among animals, we notice that certain structures co-exist in each member of certain classes. Thus in mammals, *i.e.*, animals that suckle their young, the head always rests on the vertebral column by two knobs, or condyles, and the blood has red corpuscles without nuclei. Animals with an even number of hoofs have an even number of horns; those with an odd number of hoofs have an odd number of horns, or have them placed one behind the other, as in the case of the two-horned rhinoceros. Birds with long feet have long bills, those with short feet have short bills. This is true of animals of the same kind; thus pigeons with short beaks have short feet.

In considering the relation of limbs to movement, we notice in the fish that there are never more than two pairs of fins, corresponding to the two pairs of limbs in other vertebrates. The pair nearest the head are the pectoral fins, and below these come the ventral fins. Besides these there are generally some single fins placed in the medial plane of the body, as the anal fin underneatb, the dorsal fin or fins along the back, and the caudal fin, or tail at the extremity. The pectoral and ventral fins are not much used in swimming; they enable the fish to keep its balance, but locomotion is accomplished mainly by the tail. This describes the arc of an ellipse first in one direction and then in the other, and the result is a forward motion. The body of a fish is of the same specific gravity as the water in which it lives. It is provided with a swim-bladder, homologous with the lungs of land animals, and by contracting the muscular coat of this bladder it, and consequently the whole body, becomes smaller while the weight is unchanged, and so the fish sinks. On allowing this bladder to expand again, the animal rises. As a dead fish loses the control over the muscles of the swim-bladder, it naturally expands, and so dead fish will be found floating at the surface of the water. The connection between the swim bladder and the lung is illustrated in the ganoid fishes by the fact that many of them breathe by its means, as well as by their gills. It is true that in most cases the blood-vessels which take the blood to be aerated in it do not communicate directly with the heart as is the case with the lungs of higher animals, but with the adjacent parts of the body, which make it resemble rather the air-sacs of snails and other invertebrates.

We have seen that in birds the *humerus*, *radius*, and *ulna* are very much developed, while the carpal, metacarpal, and digital bones are fused together or become quite rudimentary. This frame-work is covered with three sets of feathers, the first attached to the rudimentary finger-bones and called *primaries*, the next set attached to the fore-arm (ulna and radius) and called *secondaries*, and the third attached to the humerus and called *tertiaries*. Each of these sets of strong feathers has some smaller ones to cover the bases, which from their use are spoken of as the coverts. The wings are worked by two large muscles—enormous indeed if compared with the weight of the bird—and in comparison with them the muscles of the chest, which enable us to move our arms to the front, are quite rudimentary. In order to give support to these muscles the breast-bone of birds is very highly developed, and in most cases has a high prominence called the keel, or *carina*. Birds that have long, broad, and pointed wings, like the eagle and albatross, are most suited for long and high flight. The short round wings of the common fowl are not so well fitted. In the penguin the wing is so modified that it is of no use for flight, but assists the bird to make progress through the water after diving.

OUR SCIENCE SECTION

Subscribers requiring Explanations of Difficulties in any branch of Science, or Advice upon Courses of Study, can obtain all help required by communicating with the Editor, and accompanying their query with the Coupon cut from this number.

NOTES ON PHYSICS.

BY EDWIN EDSER, A.R.C.SC.

Author of "Heat for Advanced Students," "Light for Students," "Differential and Integral Calculus for Beginners," etc.

General Physics.

A bicycle tyre leaks at the valve, where it is found that, if wetted, a bubble ¼ of an inch in diameter is blown in from 55 to 65 seconds. How long will it take for the pressure to fall to half its amount? The inner diameter of the air-tube may be taken as 1¼ inch, and the diameter of the axis of the air-tube as 26½ inches.

London University, B.Sc. Hons. (External Students), 1904.

From the fact that the dimensions of the air-tube are given with some pretension to exactness, it would appear that it is required to find the time needed for the pressure in the air-tube to fall to one half of its original value. It is easily seen, however, that the data given in the question are inadequate for this purpose. For suppose the original pressure in the tube to have been but slightly greater than that of the atmosphere, while the leak of the valve was fairly large; in these circumstances a bubble of the given dimensions might be blown in the given time, but the internal pressure of the tube would never fall to half its original amount, since to do so it would have to fall below the external or atmospheric pressure.

It is easily proved that the fall of pressure in the tube during the formation of the bubble must have been equal to vP/V, where v is the volume of the bubble, P is the final pressure of the air within the bubble, and V is the volume of the air-tube. In order to solve the problem, however, we must know the ratio of the fall of pressure to the original pressure in the tube, and this cannot be obtained from the data given.

It is possible (but not very probable) that the pressure of the air within the bubble is referred to; this is equal to the atmospheric pressure *plus* the pressure produced by the bubble in virtue of its surface tension. The pressure due to surface tension of the bubble varies inversely as the radius of the bubble; therefore when the difference between the internal and external pressures of the bubble falls to half its original amount, the bubble will have acquired twice the original diameter, and eight times its original volume; hence the mass of gas contained by the bubble must have increased fourfold. Assuming that equal masses of gas leak from the valve in equal times, the time required would be four minutes.

Define vapour tension, vapour density, surface tension, and viscosity. How do all or any of these affect the draining and drying of a long vertical tube open at both ends and wetted inside with the liquid? If any other physical properties of the liquid affect the draining or the drying, mention them. Consider cold water, water near the boiling-point, and cold ether or benzene in your answer.

London University, B.Sc. Pass (External Students), 1903.

Vapour Tension.—When a liquid is confined in a closed vessel which it does not fill, evaporation occurs until the pressure of the vapour in the space above the liquid attains a definite value, depending only on the temperature of the vessel and its contents. Evaporation then ceases, and the space is said to be saturated with the vapour of the liquid; the pressure exerted by the saturated vapour is called the vapour tension or vapour pressure of the liquid.

Vapour Density.—The vapour density is the mass of vapour contained in a space of one cubic centimetre.

Surface Tension.—The surface of a liquid acts somewhat like an elastic membrane, in so far as it tends to contract to the smallest area possible under the given conditions. Let an imaginary line one centimetre long be drawn on the surface of the liquid, then the pull of the surface at right angles to this line, and on either side of it, is defined as the surface tension of the liquid. The surface tension is also equal to the energy per square centimetre of the surface.

Viscosity.—That property of a fluid which opposes the relative motion of its parts is called viscosity. The coefficient of viscosity of a fluid is defined as follows: Let a fluid be moving in a uniform stream over a stationary plane surface; then the fluid in contact with the surface will be at rest, and at all points at a uniform distance from the surface the velocity will be uniform, increasing as the distance from the surface increases. Thus at all points in an imaginary plane drawn parallel to the surface the velocity will have a constant value, and at points nearer to the surface the velocity will be less, and at points farther from the surface the velocity will be greater. The change of velocity per unit distance from the imaginary plane is called the *velocity gradient* at a point in that plane. Further, the more rapidly moving fluid on the farther side of the imaginary plane exerts a tangential force on the fluid in that plane; the tangential force per unit area, divided by the velocity gradient at the point in question, is defined as the coefficient of viscosity of the fluid.

Draining of a Tube.—If the interior surface of a tube is chemically clean, a layer of water on that surface will remain uniform, without showing any tendency to collect into drops. The water will flow downwards, the film becoming thinner and thinner; the rate at which the flow occurs will be inversely proportional to the viscosity. The viscosity of water diminishes rapidly as its temperature rises, and therefore hot water will drain from a tube more quickly than cold water. The viscosity of ether is much less than that of water, so that ether will drain from a tube more quickly than water.

If the interior surface of the tube is not chemically clean, water will collect in small drops on it; this action is due to the surface tension of the water. Each drop is supported by its elastic "skin." The surface tension of water diminishes when the temperature rises; hence, if the tube is heated, the elastic skin of the drops becomes too weak to support them, and the drops run down the tube.

The density of the liquid affects the rate at which the tube will drain; other things being equal, a dense liquid will drain more quickly than one that is less dense.

Drying of a Tube.—The liquid will evaporate into the interior of the tube at a rate which is roughly proportional to the difference between the pressure of the saturated vapour of the liquid and the pressure of the vapour actually in the tube. Thus, if the space is saturated, evaporation ceases; and in order that evaporation shall progress uniformly, the vapour must be removed from the interior of the tube as quickly as it is formed. The density of the vapour is important in this respect; for if this is greater than the density of air, the vapour will continually descend and escape from the lower end of the tube, while if it is less than the density of air the vapour will rise and escape from the upper end of the tube. If the convection of the vapour is so rapid that the pressure of the vapour in the tube remains very small, the rate of evaporation will be nearly proportional to the vapour pressure of the liquid.

If the tube is wetted with cold ether, it will dry more quickly than if it were wetted by water; in the first place, because the vapour pressure of cold ether is greater than that of cold water;

and in the second, because the density of ether vapour is much greater than that of air, so that it sinks very rapidly, while aqueous vapour is only slightly less dense than air, and therefore rises but slowly. If the tube is wetted with hot water, it will dry more quickly than if the water is cold; firstly, because the vapour pressure of water increases with the temperature, and also because the air in the tube will become heated, and thus tend to rise and carry the vapour with it.

Sound.

How may the velocity of a transverse disturbance in a stretched string be calculated?

London University, B.Sc. Pass (External Students), 1904.

Let AB (Fig. 1) represent a transverse disturbance travelling from left to right along the stretched string SS, with a velocity

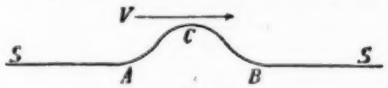


FIG. 1.

of V cms. per sec. Let the tension of the string be equal to T dynes, and let the mass of one centimetre length of the string be equal to m_1 grams.

If we set the whole of the stretched string in motion from right to left with a velocity numerically equal to that with which the disturbance is travelling from left to right, then the hump AB in the string will remain stationary in space, and each element of the string will in turn travel round this hump. At the summit C of the hump an element will be travelling from right to left with a velocity V; since the path of the element in the neighbourhood of the summit is necessarily curved, the centrifugal force acting on the element must be balanced by the force, due to the tension of the string, tending to pull the element back into the straight line SS.

Let *ab*, Fig. 2, represent a very small element of the string, of length *l*, in the act of passing the summit of the hump.

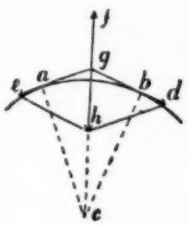


FIG. 2.

The tension of the string acts on the element along the tangents at *a* and *b*, and in order that the hump shall preserve its form, the resultant of the tensions acting at *a* and *b* must be equal and opposite to the centrifugal force acting on the centre of gravity of the element. Since the mass of the element is equal to $m_1 l$, and the element is moving with a velocity V, the centrifugal force acting on the element is equal to

$$m_1 l . \frac{V^2}{r},$$

where *r* is the radius of curvature of the path which the element is describing.

From *a* and *b* draw normals to the curve into which the string is bent; these normals will meet at some point *c*, and *c* is the centre of curvature of the string at the summit of the hump, and $ac = bc = r$, the radius of curvature at the summit.

The centrifugal force acts on the centre of gravity of the element, and tends to carry the element directly away from *c*; *i.e.* it acts along the line *cf* drawn through the centre of curvature *c* and the middle point of the element. Draw the tangents *bd* and *ae* at the ends of the element: since the tension acts along these tangents, they must meet on the line *cf*; let them meet at the point *g* on *cf*. From *g* measure off lengths *gd* and *ge*, each equal to the tension of the string; then completing the parallelogram *gdhe*, and drawing the diagonal *gh*, the latter will represent the resultant force due to the tensions at *a* and *b*, and this must be equal and opposite to the centrifugal force *gf*.

If the points *a*, *b* be joined by a straight line (not shown in Fig. 2), *abc* will be an isosceles triangle. Since *gd* is perpendicular to *bc*, and *dh* is parallel to *ge*, which is perpendicular to *ac*, it follows that the angle *gdh* is equal to the angle *acb*. Further, the triangle *gdh* is isosceles; hence the triangles *gdh* and *acb* are similar, and

$$\frac{gh}{gd} = \frac{ab}{ac}$$

Now *gh* is numerically equal to the centrifugal force acting on the element, *i.e.* to $m_1 l V^2/r$; *gd* is equal to the tension T of the string. Since the element is very small, the straight line joining *a* to *b* is practically equal to the length *l* of the curved element *ab*. Finally, *ac* is equal to *r*. Thus

$$\frac{m_1 l V^2}{r T} = \frac{l}{r}$$

$$\therefore V^2 = \frac{T}{m_1}, \text{ and } V = \sqrt{\frac{T}{m_1}}$$

Hence a disturbance travels along a stretched string with a velocity which is equal to the square root of the ratio of the tension to the mass per unit length of the string.

The following method of realising the theoretical conditions assumed in the foregoing investigation may be of interest. An indiarubber band, such as is used by hairdressers for driving their rotary brushes, is hung over a pulley A (Fig. 3), which is then rotated rapidly. The loop in which the band hangs is observed to elongate, and the band itself acquires a seeming rigidity: if the band is struck at B, a hump is formed there which remains practically stationary. This is due to the fact that the band is stretched, owing to the circumstance that as each element passes the bottom of the loop its momentum is reversed. The velocity with which the disturbance travels along the stretched band is just equal and opposite to the velocity with which the band is moving. This can be proved as follows:—

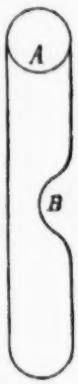


FIG. 3.

Let m_1 be the mass per unit length of the band *in its stretched condition*; then if V is the velocity with which the band travels, during each second a length V of the band has its momentum reversed at the bottom of the loop, *i.e.* a mass $m_1 V$ has its velocity changed from $(+V)$ to $(-V)$ in each second, its momentum being consequently changed from $m_1 V \times (+V) = m_1 V^2$ to $m_1 V \times (-V) = -m_1 V^2$, so that the change of momentum per second at the bottom of the loop is equal to $m_1 V^2 - (-m_1 V^2) = 2 m_1 V^2$. This gives the total force pulling the bottom of the loop downwards: half of the force is sustained by each side of the loop, so that the tension of the band is equal to $m_1 V^2$. But we have seen that if the band travels with a velocity equal to the square root of the ratio,

$$\frac{\text{tension of band}}{\text{mass per unit length of band}} = \frac{m_1 V^2}{m_1} = V^2,$$

a hump formed in the band will remain stationary in space. Since V is the actual velocity of the band, the hump will remain stationary whatever may be its velocity, provided that the tension is wholly due to the reversal of momentum at the bottom of the loop. Of course, in practice the tension is always slightly greater at the top than at the bottom of the loop, owing to the weight of the band; this causes the slow motion actually observed in the hump.

Heat.

How is the property whereby a solid conducts heat measured? Suppose 10 cm. of ice to have already formed on a pond, and that the air is at 5° C., how long approximately will it take for the next mm. to form?

Latent heat of liquefaction of ice = 80
Conductivity of ice . . = 0·005

London University, Inter. B.Sc. (External Students), 1904.

The coefficient of conductivity of a substance is equal to the rate at which heat crosses a square centimetre of area drawn perpendicular to the direction of flow of heat, divided by the temperature gradient (or fall of temperature per centimetre length in the direction of the flow of heat).

In the problem, assuming the water to be at 0° C., the temperature falls from 0° to −5° C. in passing through a thickness of 10 cm. of ice; hence temperature gradient = 5/10 = 0·5.

If 1 mm. of ice is formed on a square centimetre of area, then the heat given up in forming 1 × 0·1 = 0·1 c.cm. of ice (roughly ·1 gram of ice) passes through that area. Hence if this quantity of ice takes *t* seconds to form, the rate of flow of heat = 80 × 0·1 ÷ *t* = 8/*t*. Equating the ratio *flow of heat per second : temperature gradient*, to the conductivity, we obtain

$$\therefore \frac{8}{0{\cdot}5t} = 0{\cdot}005$$

$$\therefore t = \frac{8}{0{\cdot}5 \times 0{\cdot}005} = 3200 \text{ secs.}$$

$$= 53 \text{ mins. } 20 \text{ secs.}$$

A lump of quartz which has been fused is suspended from a "quartz fibre," and allowed to oscillate under the influence of the torsion of the fibre. If the coefficient of expansion of the material is 0·0000007, and the temperature coefficient of its rigidity is +0·00013, how many seconds a day, or what fraction of a second a day would a change of temperature of 1° C. make?

London University B.Sc. Pass (External Students), 1903.

In answering this question, we may suppose that the lump of quartz suspended from a quartz fibre forms a torsional pendulum, by the aid of which a clock is regulated. It is, of course, not necessary that the time of oscillation of the pendulum should be one second; it is only necessary that the time of vibration should be constant, and that the train of wheels in the clock should be so arranged, with relation to the escapement controlled by the pendulum, that the minute hand makes one complete revolution in an hour, the second hand making a revolution in one minute. We are required to determine how many seconds a day the clock will gain or lose if the temperature rises 1° C.

The time, T, of vibration of a torsional pendulum is given by the equation—

$$T = 2\pi\sqrt{\frac{I}{\tau}},$$

where I = moment of inertia of suspended body, τ = torque (or turning moment) required to produce unit angular twist between opposite ends of the suspending fibre.

If the body makes n vibrations per second, $n = 1/T$; therefore number of vibrations made per day

$$= 86400\, n = \frac{86400}{2\pi}\sqrt{\frac{\tau}{I}}.$$

Now, the moment of inertia of a body is equal to the mass of the body multiplied by the square of the radius of gyration about the given axis; hence, since the mass of the body is unaffected by a rise of temperature, while the radius of gyration varies as the linear dimensions of the body, 1° rise of temperature will increase the moment of inertia I to $I(1+\alpha)^2$, where α is the coefficient of expansion of the substance of which the body is composed.

The value of τ is given by the equation—

$$\tau = \frac{\pi r^4 \eta}{2l},$$

where l is the length of the suspending fibre, r is the radius of the same, and η is the coefficient of simple rigidity or shear elasticity of the fibre. When a rise of 1° C. occurs, r will be changed into $r(1+\alpha)$, and therefore r^4 will become $r^4(1+\alpha)^4$. At the same time l becomes equal to $l(1+\alpha)$. Further, if β is the temperature coefficient of the elasticity of the fibre, η becomes $\eta(1+\beta)$. Hence, when a rise of 1° C. occurs, τ is changed into

$$\tau\frac{(1+\alpha)^4(1+\beta)}{1+\alpha} = \tau(1+\alpha)^3(1+\beta).$$

Thus, if the temperature rises 1° C., the number of vibrations performed in a day becomes equal to

$$\frac{86400}{2\pi}\sqrt{\frac{\tau(1+\alpha)^3(1+\beta)}{I(1+\alpha)^2}}$$

$$= \frac{86400}{2\pi}\sqrt{\frac{\tau}{I}}\cdot\sqrt{(1+\alpha)(1+\beta)}.$$

Consequently, number of *vibrations* gained per day

$$= \frac{86400}{2\pi}\left\{\sqrt{\frac{\tau}{I}}\sqrt{(1+\alpha)(1+\beta)} - \sqrt{\frac{\tau}{I}}\right\}. \qquad (1)$$

For every n vibrations gained, where n is given by the equation

$$n = \frac{1}{2\pi}\sqrt{\frac{\tau}{I}}, \qquad (2)$$

one second will be gained. Hence, the number of *seconds* gained in a day is found by dividing (1) by (2), when we obtain number of seconds gained per day $= 86400\{\sqrt{(1+\alpha)(1+\beta)} - 1\}$. (3)

$$\alpha = 0{\cdot}0000007$$
$$\beta = 0{\cdot}00013$$
$$(1+\alpha)(1+\beta) = 1+\alpha+\beta+\alpha\beta$$

Now, $\alpha\beta$ is so small that it can be neglected in comparison with $\alpha+\beta$. Further, the value of α is smaller than the probable error in the value β, since we do not know the sixth and seventh decimal figures in β, and the first significant figure in the value of α occurs in the seventh decimal place. Hence α may be neglected.

Thus, to a sufficiently close approximation

$$\sqrt{(1+\alpha)(1+\beta)} = \sqrt{1+\beta}.$$

Using the binomial theorem, we find

$$\sqrt{1+\beta} = 1+\frac{\beta}{2}.$$

This result can also be proved in a very simple way, without using the binomial theorem. For let

$$\sqrt{1+\beta} = 1+b.$$

Since β is small, b will also be small. Then squaring both sides

$$1+\beta = 1+2b+b^2,$$

and since b is small, b^2 may be neglected in comparison with $2b$, when we find

$$2b = \beta, \qquad \text{and } b = \frac{\beta}{2}.$$

Hence, from (3), number of vibrations gained per day,

$$86400 \times \{\sqrt{1+\beta} - 1\}$$

$$= \frac{86400\times\beta}{2} = 4{\cdot}32\times10^4\times1{\cdot}3\times10^{-4} = 5{\cdot}6 \text{ secs. nearly.}$$

Light.

In a dynamometer a circular dial with an index rotates in its own plane so fast that the index cannot be read. Show how an isosceles right-angled reflecting prism may be mounted on the axis of motion, and rotated on that axis so that the dial seen through the prism by an eye also on the axis may appear at rest and the index be easily read. In what respect would a plane mirror fail where the reflecting prism succeeds?

London University, B.Sc. Hons. (External Students), 1903.

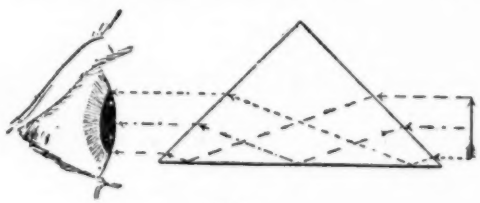


FIG. 4.

Let Fig. 4 represent the section of an isosceles right-angled prism, showing the paths of parallel rays which enter at one of the equal faces, are reflected at the large (or hypotenuse) face, and finally leave at the second of the equal faces. The incident rays are supposed to be parallel to the hypotenuse face before they enter the prism; in this case they will once more be parallel to the hypotenuse face after leaving the prism, so that their final and initial directions are parallel. This follows from the circumstance that a ray makes equal angles with the hypotenuse face before and after reflection, and therefore it is incident on the second of the equal faces at an angle equal to that at which it was refracted into the prism at the first face.

If two parallel rays initially proceeded from the upper and lower extremities of an object, it is clear that the image seen by an eye, placed on the left-hand side of the prism, will be inverted; for the ray which left the top of the object comes out of the prism as much below the parallel ray from the bottom of the object as the former was at first above the latter. Hence an isosceles reflecting prism is used for erecting images formed by the aid of a projection lantern.

Fig. 4 shows that the ray reflected from the hypotenuse face at a point midway between its edges will emerge *in a straight line* with its original direction.

We have up to now supposed the object to be perpendicular to the plane in which the hypotenuse face lies; we must now

examine the case where the object is inclined to this plane. Let the outer rectangle in Fig. 5 represent the end view of the prism; *i.e.* the view of the prism seen by the eye in Fig. 4. Let the dotted arrow represent an object placed on the further side of the prism; it is required to determine the image seen by the eye. Draw lines from the top and bottom of the object in directions parallel and perpendicular to the hypotenuse face of the prism. These lines form a rectangle, and if this rectangle were viewed through the prism, it would be seen inverted, but otherwise unchanged; consequently, the arrow which forms the diagonal of the rectangle will be seen with its point at the bottom instead of at the top right-hand corner; while the feathered end will be seen at the top instead of the bottom left-hand corner. *Thus, if the object is inclined to the hypotenuse face at a certain positive angle, the image will be seen inclined to the same face at an equal negative angle.*

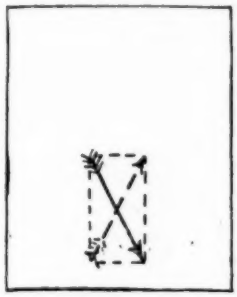


FIG. 5.

In drawing Fig. 5 it has been assumed that the arrow is placed so that the horizontal ray from its middle point is reflected from the middle point of the hypotenuse face of the prism; this ray, as already proved, will emerge in a straight line with its original direction, and therefore the middle point of the arrow is seen in its true position. In this case it is obvious that if the prism is stationary, and the arrow is rotated at a given speed about its middle point, the image seen will rotate with an equal speed but in an opposite direction about its middle point.

Let us now consider the dynamometer. Let the index at a given moment be pointing vertically upwards (Fig. 6*a*); if the surrounding rectangle represents the end view of the prism, the thick line representing the hypotenuse face, then the image seen will be pointing vertically downwards.

Fig. 6*a* is drawn on the assumption that the horizontal ray, from the point of attachment of the index to the axis of rotation, is reflected from the middle point of the hypotenuse face of the prism. In a short interval of time let the index rotate through an angle θ into the position represented in Fig. 6*b*; it is required to find the position of the prism in order that the index may still be seen pointing vertically downwards. Draw the image of the index in the position in which it is required to be seen, and bisect the angle between the directions of the actual index and its image; the hypotenuse face of the prism must obviously be placed parallel to this bisector, according to the law deduced above. Hence the new position of the prism must be that represented in end view by the rectangle in Fig. 6*b*. Comparing Figs. 6*a* and *b* it will be seen that in the former the hypotenuse face makes an angle $\pi/2$ with the vertical, while in the latter it makes an angle

$$\theta+\frac{\pi-\theta}{2}=\frac{\pi}{2}+\frac{\theta}{2}$$

with the vertical. Thus the prism must be rotated through an angle $\theta/2$ in order to bring it into the position shown in Fig. 6*b*. Hence, while the object (the index) rotates through an angle θ, the prism must rotate through an angle $\theta/2$; or the speed of rotation of the prism must be equal to half that of the index, both rotations being in the same direction. In these circumstances the index and dial (both of which rotate at the same speed) will appear to be stationary when viewed through the rotating prism.

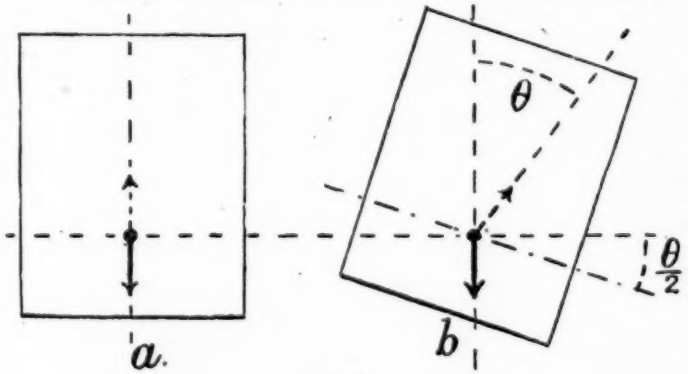


FIG. 6.

It is clear from the above reasoning that the reflection of the rays at the hypotenuse face produces the inversion; reflection from a mirror would also produce inversion (the reflections of objects in still water are inverted), but the reflected rays would not be parallel to their original direction, which explains why an ordinary plane mirror would fail where the prism succeeds.

Electricity and Magnetism.

A shunt wound electro-motor is connected to the town mains through a certain considerable resistance. It is then found that the motor remains at rest, but if a starting resistance is interposed in the armature branch it immediately starts, or if without introducing the starting resistance it is started by hand it will increase in speed to a small extent and continue to rotate. Explain this.

London University, B.Sc. Pass (External Students), 1904.

The force acting on an armature conductor is proportional to the product of the current flowing through the conductor and the magnetic field in the air gap. The magnetic field depends on the current flowing through the magnetising coils, which are connected as a shunt across the armature terminals. Hence, if v is the small P.D. across the armature terminals, the magnetising current will be proportional to v. A fall of potential equal to that between the town mains will occur in the high resistance connected in series with the motor and in the armature; if r is the resistance of the armature, and R is the series resistance, the fall of potential v in the armature will be equal to $r/(R+r)$ times the voltage of supply, since the fall of potential in any part of a circuit is proportional to the resistance of that part of the circuit. Since the armature resistance r of a shunt wound motor is always very small, v will be small, and therefore there will be no appreciable current in the magnetising coils, and no field in the air gap. Hence the motor does not start.

Now let a resistance R′ be interposed in the armature branch; the fall of potential v' in this resistance and the armature will now be proportional to $(R'+r)/(R'+r+R)$, and will be greater than the previous value of v; and since the P.D. across the shunt circuit will be equal to v', there will now be an appreciable current in the magnetising coils, and an appreciable field in the air gap. Thus, although the current flowing through the armature conductors has been diminished, the increase in the magnetic field has led to an increase in the value of the product *current* × *field*, and hence the motor starts.

When, without interposing the starting resistance, the armature is started by hand, a back E.M.F. is generated in the armature, due to its rotation in the small magnetic field in the air gap; this back E.M.F. sends a current through the shunt magnetising coils, the field in the air gap increases, and therefore the force acting on the armature conductors increases, as it did when the starting resistance was used. It is, of course, supposed that the motor is started by hand in the direction in which it would rotate if the starting resistance were used; in these circumstances the armature continues to rotate, as stated in the question.

A Magnetic Blackboard.—An ingenious teacher at St. Gilles, a suburb of Brussels, has invented a magnetic blackboard. Penetrating this blackboard is a number of magnetised strips of steel, and with the board itself are supplied 220 narrow pieces of steel tinted in two colours, the whole costing from 50 to 70 francs. The strips of steel have only to be placed on the board, when they adhere to it. With these, triangles, squares, and other geometrical figures can readily be formed. From these simple figures more complex figures and designs, consisting of stars and lozenges, can be formed. It is claimed also that by this invention the fundamental principles of mensuration can easily be illustrated. The equality of the square described on the hypotenuse of a right-angled triangle with the sum of those described on the sides containing the right angle can be practically demonstrated on this board. It can further be used for exemplifying the elementary operations of addition, subtraction, and multiplication.

CHEMISTRY.

(ADVANCED AND HONOURS.)

BY C. A. WEST, B.SC., A.R.C.S., F.I.C.

ELECTROLYSIS (*Continued*).

FARADAY showed that the amount of an ion liberated at an electrode depended upon, and was proportional to, the amount of electricity which passed through the electrolyte. To liberate one gram of hydrogen requires 96,500 *coulombs* of electricity. (A coulomb is the quantity of electricity conveyed by a current of one ampère in one second.) Whether this quantity passes through in a long or comparatively short time is immaterial. The amount of hydrogen liberated will be the same if we pass a current of 9·65 ampères for 10,000 seconds, or one of 96·5 ampères for 1000 seconds, or ·965 ampères for 100,000 seconds. The same principle applies to other ions.

The same quantity of electricity which liberates one gram of hydrogen would, if passed through a solution of silver nitrate in water, liberate 108 grams of silver.

The mass of an ion liberated by one coulomb of electricity is called the electro-chemical equivalent of the ion.

Every mono-valent ion seems to carry the same quantity of electricity, while each di-valent ion carries twice this amount, and every tri-valent ion three times the amount, and so on. The mass of hydrogen liberated by one coulomb is ·00001038 grams. This is the electro-chemical equivalent of hydrogen. Hydrogen is taken as the standard for the comparison of chemical equivalents, and the electro-chemical equivalent of any other ion can be found by multiplying the electro-chemical equivalent of hydrogen, ·00001038, by the chemical equivalent of the ion. The chemical equivalent of an ion is obtained by dividing the sum of the atomic weights of the elements of which it is composed by its valency. To make this clear, take the following example: Sulphuric acid, when dissolved in water, breaks up largely into ions, one molecule giving two hydrogen ions each carrying its own charge of positive electricity and one complex ion SO_4, which is di-valent, and carries a negative charge equal in quantity to the sum of the two positive charges carried by the two hydrogen ions.

The dissociation may be represented by the equation

$$H_2SO_4 = 2H + SO_4.$$

The one ion of SO_4 is equivalent to two hydrogen ions. The mass of the ion compared with hydrogen as unity will be 32 for the sulphur, plus 4×16 for the four oxygen atoms, making 96. The mass of SO_4 then equivalent to one of hydrogen will be $\frac{96}{2} = 48$.

This is the chemical equivalent of the SO_4 ion. In cases where the ion is an element we may state the relation thus—

$$\text{electro-chemical equivalent} = \frac{\text{atomic weight}}{\text{valency}}.$$

Here is a table giving the atomic weights, chemical equivalents, and electro-chemical equivalents of a number of elements—

Element.	Atomic Weight.	Chemical Equivalent.	Electro-chemical Equivalent.
Silver . . .	107·7	107·7	·001118
Hydrogen . . .	1	1	·00001038
Potassium . . .	39·03	39·03	·0004051
Sodium . . .	23	23	·0002387
Copper (cupric) . .	63·18	31·59	·0003279
Oxygen . . .	15·96	7·98	·00008283
Chlorine . . .	35·37	35 37	·0003671
Iron (ferric) . .	56	18·66	·0001937
Iron ferrous) . .	56	28	·0002906

When a current of electricity is passed through an electrolyte the positive ions migrate towards the negative electrode or cathode and give up their charges to it—for instance, in the electrolysis of a dilute solution of hydrochloric acid the hydrogen ions move towards the cathode, some of them giving up their charges to it. The hydrogen atoms at the same time combine in pairs to form ordinary gaseous hydrogen according to the equation—

$$H + H = H_2.$$

The chlorine ions with their negative charges move to the anode, where the negative charges are neutralised by equal quantities of positive from the electrode, and we get ordinary gaseous chlorine according to the equation—

$$Cl + Cl = Cl_2.$$

In this case both products of the electrolysis are liberated.

Let us now consider a somewhat different case, such as the electrolysis of an aqueous solution of sodium sulphate. The sodium ions migrate to the cathode, and we might expect to find metallic sodium appearing here, but we know that metallic sodium attacks water with the production of sodium hydrate and hydrogen according to the equation—

$$2H_2O + 2Na = 2NaOH + H_2.$$

Hence for every atom of sodium which should appear at the cathode we get an atom of hydrogen, and since the atomic weight of sodium is 23 compared with hydrogen taken as unity, we find that we get one gram of hydrogen liberated at the cathode in place of 23 grams of sodium.

The SO_4 ion at the same time migrates to the positive plate or anode and receives an equal positive charge neutralising its negative charge. The SO_4 cannot be collected as such, but attacks the water of the solution, taking the hydrogen to form sulphuric acid, and liberating oxygen according to the equation—

$$2H_2O + 2SO_4 = 2H_2SO_4 + O_2.$$

We thus get one atom of oxygen for every SO_4 ion whose charge is neutralised, and since we get one of SO_4 for every two atoms of hydrogen liberated at the cathode we also get one atom of oxygen at the anode for two atoms of hydrogen at the cathode.

Hence we get twice the volume of hydrogen liberated at the cathode as we do oxygen at the anode.

It will be observed that at the same time we get sodium hydrate, an alkali, produced around the cathode and sulphuric acid around the anode.

The production of acid and alkali at the anode and cathode respectively can easily be shown experimentally by taking a glass vessel and making a partition out of blotting paper to roughly fit across the vessel, dividing it into two compartments. Now pour (slowly, so as not to disturb the paper) a strong solution of sodium sulphate into the vessel. Add sufficient litmus solution to the sodium sulphate to show a distinct colour. Now introduce into one of the compartments of the cell a platinum electrode connected to the positive terminal of a battery, and into the other compartment another platinum electrode connected to the negative electrode of the same battery. Allow the current to flow through the electrolyte, and it will be found that bubbles of gas rise from each electrode, and that the liquid around the negative electrode turns blue, showing the formation of alkali, while that round the positive electrode turns red, showing the formation of acid. Now stop the current, remove the blotting paper partition, and stir up the liquid. It will be found that the acid and alkali exactly neutralise each other, showing that they were produced in equivalent quantities.

A numerical example will help to make the application of the quantitative laws of electrolysis quite clear.

A current of 9·65 ampères is passed continuously for 5 hours 33 minutes 20 seconds through six electrolytic cells in series containing aqueous solutions of the following substances respectively:—(1) *Hydrochloric acid*, (2) *sodium chloride*, (3) *cupric sulphate*, (4) *potassium iodide*, (5) *ferric chloride*, (6) *ferrous sulphate. Calculate the weights of the substances liberated at all the electrodes.*

The number of coulombs passing through each cell is given by the product of the strength of the current in ampères into the time in seconds—

5 hours 33 minutes 20 seconds = 20,000 seconds.

The number of coulombs then is—

$$9{\cdot}65 \times 20{,}000 = 193{,}000.$$

Now 96,500 coulombs liberate one gram of hydrogen, hence the mass of hydrogen which 193,000 coulombs would liberate is—

$$\frac{193{,}000}{96{,}500} = 2 \text{ grams.}$$

(1) Taking the first cell, the hydrochloric acid gives hydrogen and chlorine,

$$2HCl = H_2 + Cl_2.$$

The mass of hydrogen as just calculated is 2 grams.

The mass of chlorine is 35·37 times as great, since 35·37 is the chemical equivalent of chlorine.

$$35{\cdot}37 \times 2 = 70{\cdot}74 \text{ grams of chlorine.}$$

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(2) In the second cell the sodium chloride gives rise to sodium and chlorine, thus—

$$2NaCl = 2Na + Cl_2$$

but the sodium attacks the water, forming sodium hydrate and hydrogen—

$$2Na + 2H_2O = 2NaOH + H_2$$

so that hydrogen and chlorine are liberated, and, of course, in the same quantities as in (1).

The sodium hydrate formed—

$$= 2 \times (23 + 15{\cdot}96 + 1) = 2 \times 39{\cdot}96 = 79{\cdot}92 \text{ grams.}$$

(3) In the third cell copper and oxygen together with sulphuric acid are produced—

$$Cu\ SO_4 = Cu + SO_4$$
$$2SO_4 + 2H_2O = 2H_2\ SO_4 + O_2$$

The weight of copper deposited—

$$= 2 \times \frac{63{\cdot}18}{2} = 2 \times 31{\cdot}59 = 63{\cdot}18 \text{ grams.}$$

The weight of sulphuric acid formed is—

$$2 \times \left(\frac{2 + 32 + 63{\cdot}84}{2}\right) = 97{\cdot}84.$$

(4) In the fourth cell potassium and iodine are primarily produced.

$$2KI = 2K + I_2$$

but the potassium attacks the water—

$$2K + 2H_2O = 2KOH + H_2$$

2 grams of hydrogen being produced.

The weight of iodine liberated—

$$= 2 \times 126{\cdot}85 = 253{\cdot}7 \text{ grams.}$$

The weight of potassium hydrate—

$$= 2 \times (39{\cdot}03 + 15{\cdot}96 + 1)$$
$$= 2 \times 55\ 99 = 111{\cdot}98 \text{ grams.}$$

(5) In the fifth cell iron and chlorine are produced, the chlorine being the same in amount as in cells (1) and (2).

$$\text{The iron} = 2 \times \frac{56}{3} = \frac{112}{3} = 37{\cdot}3 \text{ grams.}$$

(The valency of the iron is 3.)

(6) In the sixth cell iron and SO_4 are primarily produced, but the SO_4 attacks the water, forming sulphuric acid and oxygen in amounts equal to those produced in cell (3).

$$\text{The iron} = 2 \times \frac{56}{2} = 56 \text{ grams.}$$

(The valency of the iron in this case is 2.)

PHYSIOGRAPHY.

(STAGES 2 AND 3.)

THE THERMOMETER (*Continued*).

LAST month we learned that any two metals, if they are joined together and the circuit is completed, are capable of giving rise to a current when one of the junctions is heated to a temperature above that of the other. We also saw that in the case of pure metals the lines representing the thermo-electric powers on Thomson's thermo-electric diagram were all straight lines.

Although the thermo-electric powers of alloys do not behave in exactly the same way, still we find it convenient for some purposes to use alloys.

If we wish to measure very high temperatures by means of a thermo-electric couple, it is obvious that we must use metals with high melting points. It is found that the most suitable couple for this purpose is one made of platinum for one metal, and an alloy of platinum-iridium or platinum-rhodium as the other.

If accurate results are wanted, it is necessary to keep one junction of the couple at a known temperature—say 0° C. or 100° C.—in ice or steam.

The junction which is to be placed in the furnace or other position whose temperature is required is usually protected by a porcelain tube, just in the same way as the resistance thermometers are protected.

Suppose the thermo-couple is made, we must next have an indicator for use with it. This usually takes the form of a sensitive galvanometer of a fairly high resistance. It is necessary that the resistance should be high so that the changes in the resistance of the thermo-couple and the wires leading to it, which are brought about by changes in temperature, shall be very small in comparison, in order that, for practical purposes, they may be neglected.

The thermo-couple and galvanometer are calibrated together before they can be used. A good method of calibrating them is as follows:—

Both junctions are put in ice to insure them being brought to the same temperature. No current flows through the galvanometer, and the point at which the needle rests is marked 0° C. The cold junction is still kept in ice, and the other junction placed in steam. A current now flows, and the galvanometer needle moves. The point at which it now comes to rest is marked 100° C.

The hot junction may next be put in the vapour of boiling sulphur, and the point at which the needle now rests is marked 440° C., the boiling point of sulphur. The intermediate spaces are divided into degrees, or more generally into divisions, each representing ten degrees. For higher temperatures the scale is continued by making divisions equal to those already obtained. It is, however, better not to place too much reliance on this method of extending the scale, but to check some of the higher temperatures by comparison with the air thermometer (up to about 1000° C.), and with the platinum resistance thermometer for temperatures up to 1400° C. or 1500° C.

Above about 1600° C. we have no accurate methods of measuring temperatures. The thermo-electric thermometer, like the platinum resistance thermometer, may also be used for measuring low temperatures when a mercury thermometer would be of no use owing to the mercury solidifying.

At very low temperatures, however, Professor Dewar has shown that neither the platinum resistance thermometer nor the thermo-couple can be relied upon for exact readings.

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It will be remembered that the volume of a gas being kept constant the pressure varies directly as the absolute temperature. Also, the boiling point of a liquid depends on the pressure. Water, for instance, may be made to boil at the ordinary temperature of the air if the pressure is sufficiently reduced. It will thus be seen that if the pressure is kept sufficiently low a substance may be kept in the gaseous state at temperatures considerably below the liquefying temperature under ordinary atmospheric pressure.

Hydrogen may, therefore, be used as a thermometric substance for temperatures below the temperature at which it boils under normal pressure.

By measuring the pressures of a given mass of hydrogen, the volume being kept constant, we can then get practical measurements of temperatures below the boiling point of hydrogen, and this is given as − 253° C., or only twenty degrees or so above the absolute zero of temperature. The air thermometer may also be u-ed for temperatures up to about 1000° C. if a porcelain bulb is used to contain the gas, but above this temperature porcelain does not remain sufficiently rigid to allow of accurate determinations being made. We may say broadly, then, that the gas thermometer may be taken as being reliable from about − 250° C. to 1000° C., and the platinum, platinum-iridium thermo-couple, and also the platinum resistance thermometer, from about − 200° C. to approximately 1600° C.

Many methods have been suggested and tried from time to time for measuring higher temperatures, but none can be said to be satisfactory. Rough approximations may be made by heating clay balls to the required temperature and dropping them into water, the amount of heat given up being measured in this way. Assuming that the specific heat of the ball remains the same at high temperatures as at low temperatures, the temperature may be calculated, but we know that as the

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temperature rises the specific heats of many substances change. Other methods employed depend on the colour changes produced in the character of the light examined spectroscopically. These methods, however, are only approximate, so that at present accurate measurements are limited to within about 1500° C. or 1600° C.

MATHEMATICS.

(STAGES 2 AND 3.)

BY FRANK CASTLE, M.I.M.E.,

Royal College of Science; Lecturer on Mathematics, etc., Morley College; Author of "Elementary Practical Physics," "Practical Mathematics," etc.

Logarithms.—The logarithm of a number to a given base is the index of the power to which that base must be raised to equal the number.

If $y = a^x$, then x is called the logarithm of y to the base a, and is written in the form $\log_a y = x$.

$$\text{As } 8 = 2^3, \therefore \log_2 8 = 3.$$

Product.—Let $\log m = x$, and $\log n = y$, where m and n are two numbers, then if the base be a we have—

$$m = a^x,\ n = a^y,$$
$$\therefore m \times n = a^{x+y},$$
$$\text{or } \log_a mn = x + y = \log_a m + \log_a n.$$

Similarly, if the base be 10, then

$$\log_{10} mn = \log m + \log n.$$

In words, add the logarithms of the multiplier and multiplicand together, the sum is the logarithm of their product.

Quotient.—In a similar manner for division subtract the logarithm of the divisor from the logarithm of the dividend, the result is the logarithm of the quotient—*i.e.*

$$\log_{10} a \div b = \log a - \log b.$$

Involution and Evolution.—If $a = x^m$, then $m = \log_x a$.

$$a^n = (x^m)^n = x^{mn},$$
$$\therefore \log_x a^n = mn = n \log_x a.$$

If the base be 10, then $a = 10^m$

$$a^n = (10^m)^n = 10^{mn}$$
$$\log_{10} a^n = mn = n \log a.$$

Napierian logarithms.—In this system the base is 2·718 . . . or 2·7183 to five figures. Usually the letter e is used to denote this base.

Thus the logarithm of 2 to the base 10 would be written $\log_{10} 2$ or simply $\log 2$, but the Napierian or hyperbolic logarithm would be written $\log_e 2$.

Logarithms to base 10 are usually known as common logarithms, the advantages of such a base being—(i.) it is not necessary to print the characteristics; (ii.) the same mantissa serves for a series of numbers.

Ex. 1. Define the logarithm of a given number to an assigned base.

State and prove the rule for extracting the square root of a given number by logarithms.

Write down the logarithms (with positive mantissa) of the following numbers:—

(a) 13, 1300, $\frac{1}{12}$, $\sqrt{\frac{7}{12}}$.

(b) Find the numerical value of $\sqrt[3]{\frac{5}{13}}$. (1901)

(a) $\log 13 = 1{\cdot}1139434$, $\log 1300 = 3{\cdot}1139434$.

$\log \frac{1}{12} = \log 1 - \log 3 - 2 \log 2.$
$= 0 - {\cdot}4771213 - 2 \times {\cdot}3010300.$
$= -1{\cdot}0791813.$
$= \bar{2}{\cdot}9208187.$

$\log \sqrt{\frac{7}{12}} = \frac{1}{2}(\log 7 - 2 \log 2 - \log 3)$
$= \frac{1}{2}({\cdot}8450980 - 2 \times {\cdot}3010300 - {\cdot}4771213) = \bar{1}{\cdot}8829583.$

Let x denote the numerical value of $\sqrt[3]{\frac{5}{13}}$.

Then $\log x = \frac{1}{3}(\log 5 - \log 13)$
$= \frac{1}{3}(\log 10 - \log 2 - \log 13)$
$= \frac{1}{3}(1 - {\cdot}3010300 - 1{\cdot}1139434) = -{\cdot}1383245 =$
$\bar{1}{\cdot}8616755.$

From tables $\log 72724 = {\cdot}8616778$
" " " $72723 = {\cdot}8616718$
$\overline{{\cdot}0000060}$

Also ${\cdot}8616756 - {\cdot}8616718 = {\cdot}0000037$
$\therefore$ proportional part is $37 \div 60 = {\cdot}0000006$.

$\therefore \log \sqrt[3]{\frac{5}{13}} = \bar{0}{\cdot}727236$

Ex. 2. What number is the base of the common logarithms? Why is that number used for that purpose?

If $N = \sqrt{10} \times \sqrt[3]{10} \div \sqrt{10}$, find the common logarithm of N. (1902)

$$\text{Log } N = \tfrac{1}{2} \log 10 + \tfrac{1}{3} \log 10 - \tfrac{1}{2} \log 10 = \tfrac{1}{2} + \tfrac{1}{3} - \tfrac{1}{2} = \tfrac{7}{12}.$$

Ex. 3. (a) Define a logarithm.

Reasoning from your definition, find the logarithm of 81 to base 3, and the logarithm of $\frac{1}{4}$ to base 2.

(b) By means of the tables, find the common logarithm of 0·00144.

(c) Find the numerical value of—

$$(6)^{\frac{1}{4}} \times (12)^{\frac{1}{4}} \div (125)^{\frac{1}{12}}. \quad (1905)$$

(b) $0{\cdot}00144 = 144 \times 10^{-5} = 3^2 \times 2^4 \times 10^{-5}$.
$\log x = 2 \log 3 + 4 \log 2 - 5 = \bar{3}{\cdot}1583626.$

(c) Let $x = \frac{6^{\frac{1}{4}} \times 12^{\frac{1}{4}}}{(125)^{\frac{1}{12}}}$.

$\therefore \log x = \frac{1}{4} \log 6 + \frac{1}{4} \log 12 - \frac{1}{12} \log 125 = \bar{1}{\cdot}9509925$
$\therefore x = 0{\cdot}89329.$

Ex. 4. (a) Express the angle 249° 35′ 42″ in degrees and the decimal of a degree, and find by logarithms, as accurately as you can with the given value of $\log \pi$, the measure of the angle in radians (or circular measure).

(b) The circumference of a circle is 4×10^7 metres; find in metres the diameter of the circle as accurately as the logarithms given in the table will allow. (1902)

(a) $249° 35' 42'' = 249°{\cdot}595.$

$$N = \text{number of radians} = \frac{249{\cdot}595 \times 3{\cdot}14159}{180}.$$

$\log N = \log 249{\cdot}595 + \log 3{\cdot}14159 - (2 \log 3 + \log 20) = 0{\cdot}6391132.$

$\therefore N = 4{\cdot}356254.$

(b) Let d denote the diameter of the circle,

then $\pi d = 4 \times 10^7$,

$$\text{or } d = \frac{4 \times 10^7}{\pi}.$$

$\log d = \log 4 + 7 - \log \pi.$

$\therefore d = 12732396$ metres.

Ex. 5. (a) Define the logarithm of a number to a given base, and state what are the practical advantages of taking 10 as the base of a system of logarithms.

(b) Explain how it is that $\log (a^3) = 3 \log a$.

(c) Using the given table, find $\log 36$, and the numerical value of the fifth root of 1·125. (1903)

(b) Let $x = \log_{10} a^3$

$\therefore 10^x = a^3$

$$\text{or } \frac{x}{3} = \log_{10} a$$

$\therefore x = 3 \log_{10} a.$

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temperature rises the specific heats of many substances change. Other methods employed depend on the colour changes produced in the character of the light examined spectroscopically. These methods, however, are only approximate, so that at present accurate measurements are limited to within about 1500° C. or 1600° C.

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(STAGES 2 AND 3.)

BY FRANK CASTLE, M.I.M.E.,

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Logarithms.—The logarithm of a number to a given base is the index of the power to which that base must be raised to equal the number.

If $y=a^x$, then x is called the logarithm of y to the base a, and is written in the form $\log_a y=x$.

$$\text{As } 8=2^3, \therefore \log_2 8=3.$$

Product.—Let $\log m=x$, and $\log n=y$, where m and n are two numbers, then if the base be a we have—

$$m=a^x,\ n=a^y,$$
$$\therefore m\times n=a^{x+y},$$
$$\text{or } \log_a mn=x+y=\log_a m+\log_a n.$$

Similarly, if the base be 10, then

$$\log_{10} mn=\log m+\log n.$$

In words, add the logarithms of the multiplier and multiplicand together, the sum is the logarithm of their product.

Quotient.—In a similar manner for division subtract the logarithm of the divisor from the logarithm of the dividend, the result is the logarithm of the quotient—*i.e.*

$$\log_{10} a\div b=\log a-\log b.$$

Involution and Evolution.—If $a=x^m$, then $m=\log_x a$.

$$a^n=(x^m)^n=x^{mn},$$
$$\therefore \log_x a^n=mn=n\log_x a.$$

If the base be 10, then $a=10^m$

$$a^n=(10^m)^n=10^{mn}$$
$$\log_{10} a^n=mn=n\log a.$$

Napierian logarithms.—In this system the base is 2·718 . . . or 2·7183 to five figures. Usually the letter e is used to denote this base.

Thus the logarithm of 2 to the base 10 would be written $\log_{10} 2$ or simply $\log 2$, but the Napierian or hyperbolic logarithm would be written $\log_e 2$.

Logarithms to base 10 are usually known as common logarithms, the advantages of such a base being—(i.) it is not necessary to print the characteristics; (ii.) the same mantissa serves for a series of numbers.

Ex. 1. Define the logarithm of a given number to an assigned base.

State and prove the rule for extracting the square root of a given number by logarithms.

Write down the logarithms (with positive mantissa) of the following numbers:—

(*a*) 13, 1300, $\frac{1}{12}$, $\sqrt{\frac{7}{12}}$.

(*b*) Find the numerical value of $\sqrt[3]{\frac{5}{13}}$. (1901)

(*a*) $\log 13=1\cdot1139434$, $\log 1300=3\cdot1139434$.

$\log \frac{1}{13}=\log 1-\log 3-2\log 2.$
$=0-\cdot4771213-2\times\cdot3010300.$
$=-1\cdot0791813.$
$=\bar{2}\cdot9208187.$

$$\log\sqrt{\frac{7}{12}}=\frac{1}{2}(\log 7-2\log 2-\log 3)$$
$$=\tfrac{1}{2}(\cdot8450980-2\times\cdot3010300-\cdot4771213)=\bar{1}\cdot8829583.$$

Let x denote the numerical value of $\sqrt[3]{\frac{5}{13}}$

Then $\log x=\frac{1}{3}(\log 5-\log 13)$
$=\frac{1}{3}(\log 10-\log 2-\log 13)$
$=\frac{1}{3}(1-\cdot3010300-1\cdot1139434)=-\cdot1383245=$
$\bar{1}\cdot8616755.$

From tables $\log 72724=\cdot8616778$
" " " $72723=\cdot8616718$
$\cdot0000060$

Also $\cdot8616756-\cdot8616718=\cdot0000037$
$\therefore$ proportional part is $37\div60=\cdot0000006.$

$$\therefore \log\sqrt[3]{\frac{5}{13}}=\bar{1}\cdot727236$$

Ex. 2. What number is the base of the common logarithms? Why is that number used for that purpose?

If $N=\sqrt{10}\times\sqrt[3]{10}\div\sqrt{10}$, find the common logarithm of N. (1902)

$$\text{Log } N=\tfrac{1}{2}\log 10+\tfrac{1}{3}\log 10-\tfrac{1}{2}\log 10=\tfrac{1}{3}+\tfrac{1}{3}-\tfrac{1}{2}=\tfrac{7}{17}.$$

Ex. 3. (*a*) Define a logarithm.

Reasoning from your definition, find the logarithm of 81 to base 3, and the logarithm of $\frac{1}{4}$ to base 2.

(*b*) By means of the tables, find the common logarithm of 0·00144.

(*c*) Find the numerical value of—

$$(6)^{\frac{1}{4}}\times(12)^{\frac{1}{3}}\div(125)^{\frac{1}{3}}. \quad (1905)$$

(*b*) $0\cdot00144=144\times10^{-5}=3^2\times2^4\times10^{-5}.$
$\log x=2\log 3+4\log 2-5=\bar{3}\cdot1583626.$

(*c*) Let $x=\frac{6^{\frac{1}{4}}\times12^{\frac{1}{3}}}{(125)^{\frac{1}{3}}}.$

$\therefore \log x=\frac{1}{4}\log 6+\frac{1}{3}\log 12-\frac{1}{3}\log 125=\bar{1}\cdot9509925$
$\therefore x=0\cdot89329.$

Ex. 4. (*a*) Express the angle 249° 35′ 42″ in degrees and the decimal of a degree, and find by logarithms, as accurately as you can with the given value of $\log\pi$, the measure of the angle in radians (or circular measure).

(*b*) The circumference of a circle is 4×10^7 metres; find in metres the diameter of the circle as accurately as the logarithms given in the table will allow. (1902)

(*a*) $249°\ 35'\ 42''=249°\cdot595.$

$$N=\text{number of radians}=\frac{249\cdot595\times3\cdot14159}{180}.$$

$\log N=\log 249\cdot595+\log 3\cdot14159-(2\log 3+\log 20)=0\cdot6391132.$

$\therefore N=4\cdot356254.$

(*b*) Let d denote the diameter of the circle,

then $\pi d=4\times10^7,$
$$\text{or } d=\frac{4\times10^7}{\pi}.$$
$\log d=\log 4+7-\log\pi.$
$\therefore d=12732396$ metres.

Ex. 5. (*a*) Define the logarithm of a number to a given base, and state what are the practical advantages of taking 10 as the base of a system of logarithms.

(*b*) Explain how it is that $\log(a^3)=3\log a$.

(*c*) Using the given table, find log 36, and the numerical value of the fifth root of 1·125. (1903)

(*b*) Let $x=\log_{10}a^3$
$\therefore 10^x=a^3$
$$\text{or } \frac{x}{3}=\log_{10}a$$
$\therefore x=3\log_{10}a.$

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(*c*) $36 = 3^2 \times 2^2$

$\therefore \log 36 = 2(\log 3 + \log 2) = 1{\cdot}5563026$

$1{\cdot}125 = 1\frac{1}{8} = \frac{9}{8}$

$\therefore \sqrt[5]{1{\cdot}125} = \sqrt[5]{\frac{9}{8}}$

$\log x = \frac{1}{5}(2 \log 3 - 3 \log 2) = \bar{1}{\cdot}0102305$

$\log 10239 = 4{\cdot}0102575$

$\log 10238 = 4{\cdot}0102151$

$\bar{1}{\cdot}0000424$

also $\bar{1}{\cdot}0102305 - \bar{1}{\cdot}0102151 = \bar{1}{\cdot}0000154$

$\therefore 154 \div 424 = {\cdot}363.$

Hence $x = \sqrt[5]{1{\cdot}125} = 1{\cdot}0238363.$

Ex. 6. Define a logarithm.

Illustrate the rule that $\log \frac{b}{a} = \log b - \log a$ by taking common logarithms and letting $b = 1000$, $a = 10$, and proving that the rule is true in this case.

Find by logarithms the numerical values of—

(*a*) $(2{\cdot}45)^{10}$. (*b*) $\left(\frac{2}{7}\right)^{\frac{1}{3}}$. (1904)

Ans. (*a*) 7792·2. (*b*) 0·4715841.

Ex. 7. (*a*) State and prove the rule for extracting the cube root of a given number by logarithms.

(*b*) If $a^2 + b^2 = 11ab$, show that $\log \frac{a-b}{3} = \frac{1}{2}(\log a + \log b)$. (1902)

Ex. 8. Find by logarithms the cube root of $5 \div 2\pi$. (1902)

Ans. 0·9266816.

Ex. 9. (*a*) Define the logarithm of a number to a given base, and show that

$$\log_a \frac{m}{n} = \log_a m - \log_a n.$$

(*b*) Find the logarithm (with a positive mantissa) of $0{\cdot}049 \div 14{\cdot}4$.

(*c*) Find the numerical value of the ratio of the fourth power of 2·24 to the fifth root of 147. (1900)

Ans. (*b*) $\bar{3}{\cdot}5318334$. (*c*) 9·27958.

Ex. 10. Define logarithm, base, characteristic, mantissa.

(*a*) Find x, having given that $\frac{2}{3}$ is the logarithm of x to the base 8.

(*b*) Find the common logarithm of the square root of 0·00119 and calculate the numerical value of $(0{\cdot}084)^{\frac{1}{3}} \div (0{\cdot}34)^3$. (1899)

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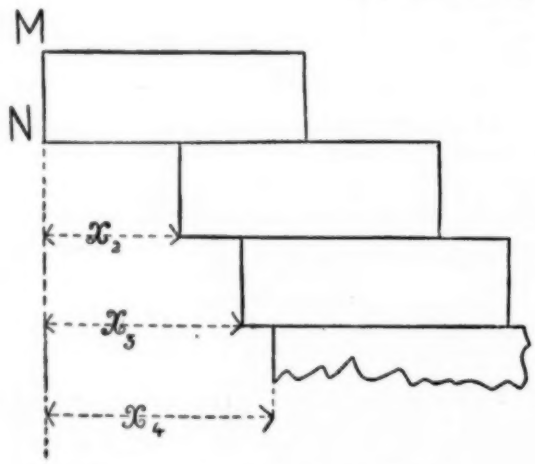
Sinew.—A number of rectangular bricks are so placed that each overlaps the next below by the greatest amount possible. Show that the distances they overlap (beginning at the top) are proportional to the following fractions: $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5} \ldots$.

(*Tutorial Statics.*)



Let MN be the overlapping end of the uppermost brick, and let $x_1, x_2, x_3 \ldots$ be the distances of the ends of the bricks from the vertical plane through MN. Consider the equilibrium of the first two bricks about the edge of the third. Taking moments about the vertical through MN, and denoting the length of each brick by $2l$ and the weight by w, we have

$$wx_2 + w(x_2 + l) = 2wx_3.$$

Similarly for the equilibrium of the first three about the edge of the fourth we have

$$2wx_3 + w(x_3 + l) = 3wx_4.$$

And in general for the equilibrium of the first n bricks about the edge of $(n+1)$th we have

$$(n-1)wx_n + w(x_n + l) = nwx_{n+1}.$$

Hence

$$nx_n + l = nx_{n+1}.$$

$$\therefore x_{n+1} - x_n = \frac{l}{n}.$$

From this result we have

$$x_2 - x_1 = l$$

$$x_3 - x_2 = \frac{l}{2}$$

$$x_4 - x_3 = \frac{l}{3}$$

$$\ldots = \ldots$$

Hence the distances that the bricks overlap are proportional to $\frac{1}{1}, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$, etc.

Scamp.—The example is probably intended to be worked by ordinary long division.

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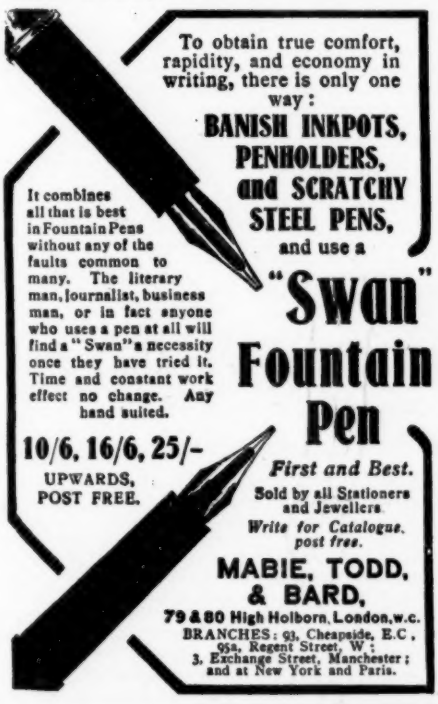

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Beauty of Figure: How to Acquire and Retain it by Means of Easy and Practical Home Exercises. By Deborah Primrose, of "Hearth and Home," &c. With 72 illustrations, photographs from life. In the first chapter we read with considerable surprise that "the ideally handsome man of that early period . . . was a head elongated from before backwards, with prominent cheek-bones, deep-set eyes, and an average stature of six feet," but in a book written by a woman for women we need not take things quite literally. The exercises prescribed are numerous and varied, and the woman who conscientiously works through them with a view to the results promised in the book will at least deserve success if she cannot command it. In all seriousness, however, the principles of the work must be cordially commended. The excellent photographs are a useful feature of the work. We regret the high-heeled shoes, even after reading the justification of their use given at the end of the book, and any girl who is misled by these figures and attempts the gymnastics in such foot-gear, will possibly read the explanation of their use while nursing a sprained ankle.

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Psychology. By C. W. Saleeby, M.D. **Sociology.** By C. W. Saleeby, M.D. (Jack's Scientific Series.) Even for Dr. Saleeby these are weird productions, and offer in most aspects a vivid contrast to several admirable volumes of this series which have already been reviewed in this column. One wonders much what would be the mental state of a reader ignorant of the sciences treated in these volumes who should turn to them for enlightenment; his last state would certainly be worse than his first. Instead of a lucid exposition of known facts and accepted inferences from them he will find some theorising, some polemics against positions which are evidently misunderstood by the writer, and some fair essays of the popular magazine type. For understanding the actual state of the sciences, even in a superficial way, he will find little to help him.

LONGMANS, GREEN AND CO., PATERNOSTER ROW, LONDON, E.C.

Boys and their Management in School. By H. Bompas Smith, M.A., Headmaster of St. Mary's School, Walsall. Mr. Smith's little book is strictly confined to the subject of management, or what is often loosely described as "Discipline," and by "School" is to be understood an English Boarding School. Within these limitations the book is an excellent one. The writer follows a plan which is new as yet, but which will certainly be followed in the future by all who produce educational works of any value—the plan of beginning with the boy. He summarises in a useful though brief fashion the outstanding characteristics of boys at the various stages of school life, 8 to 13, 13 to 16, and 16 to 19 years respectively, and he makes a very praiseworthy effort, in the main successful, to base upon this summary the counsels and rules of practice which follow. One might now and then wish for a little more critical examination of accepted forms of procedure, but the book is a small one, and what is offered is so good that we leave it as a wish without pressing the point.

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Mr. Ubbledejub and the House Fairies. By A. Thorburn, with illustrations by May Farady and Dorothy Newill. This is a book for the very little ones, to be read to them, not by them. The fairies are highly moral, even didactic, in their sayings and doings, and are somewhat lacking in the fine old elementary wickedness which those not now young used to shudder at and secretly admire. But it takes all sorts of fairies, as well as people, to make a world, and these will doubtless perform their function among the generation about to rise.

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The Garden of Childhood: Stories for Little Folk at School and at Home. By Alice M. Chesterton, with illustrations by Gertrude M. Bradley. (Issued for the Moral Instruction League, 19 Buckingham Street, Strand.) If moral "instruction" is to be given in any form, this is certainly the best. The stories are of a perilous type to write—modern fairy tales, many of them, with correct morals and even a little direct advice—but they are unusually well written. Teachers of infant classes who are looking for something to read to their little ones will find the book a treasure. Some of the older classes will prefer to read the book for themselves, and to these the well-drawn illustrations will present an added charm.

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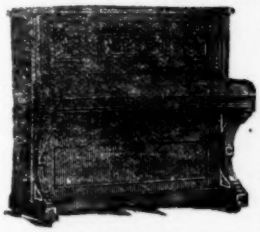

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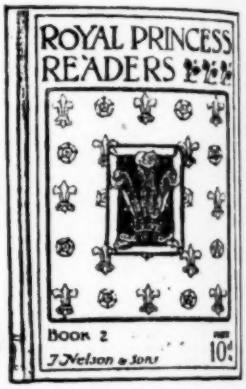

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